THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LV. No. 1402.] LONDON, MARCH 25, 1890. [42ND YEAR. Price 6d.

Ashmore, Benson, Pease, & Co., Ltd.

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SCRUBBERS.
PURIFIERS.
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Illustrated Gas-Works Catalogue.

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Parker's Imperial Black Varnish,
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STOREAGE CAPACITY 10,000 Tons.
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All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.
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Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,
Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

C. & W. WALKER.
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PURIFYING MACHINES;
CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;
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RETORT MOUTHPIECES; CONDENSERS;
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IMPROVED DRY GAS-METERS;

STATION METERS OF ALL SIZES, with PLANED JOINTS;

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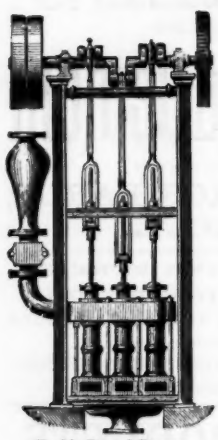
FOR PUMPING TAR, WATER, AND LIQUOR.



Treble-Barrel Pumps in Frame.

Syphon Pump.

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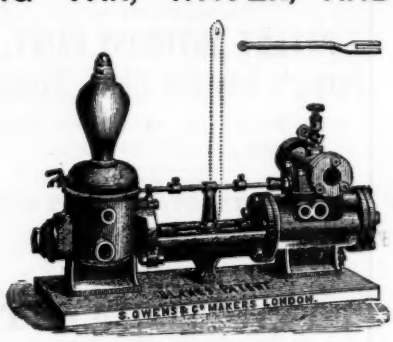

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Improved Double Action Pump.

Cast-Iron Hand-Pump.

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Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

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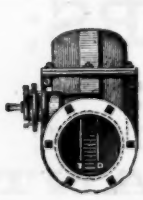

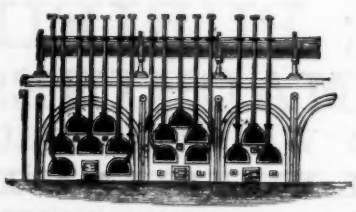

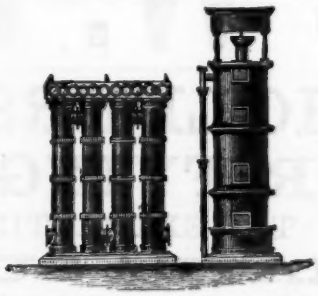

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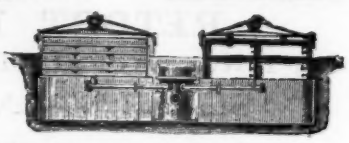

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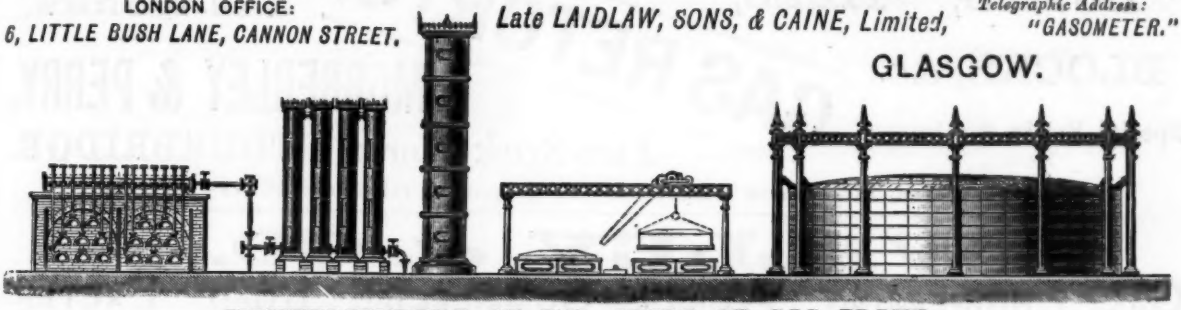

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RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
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DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT IRON TANKS;
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York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

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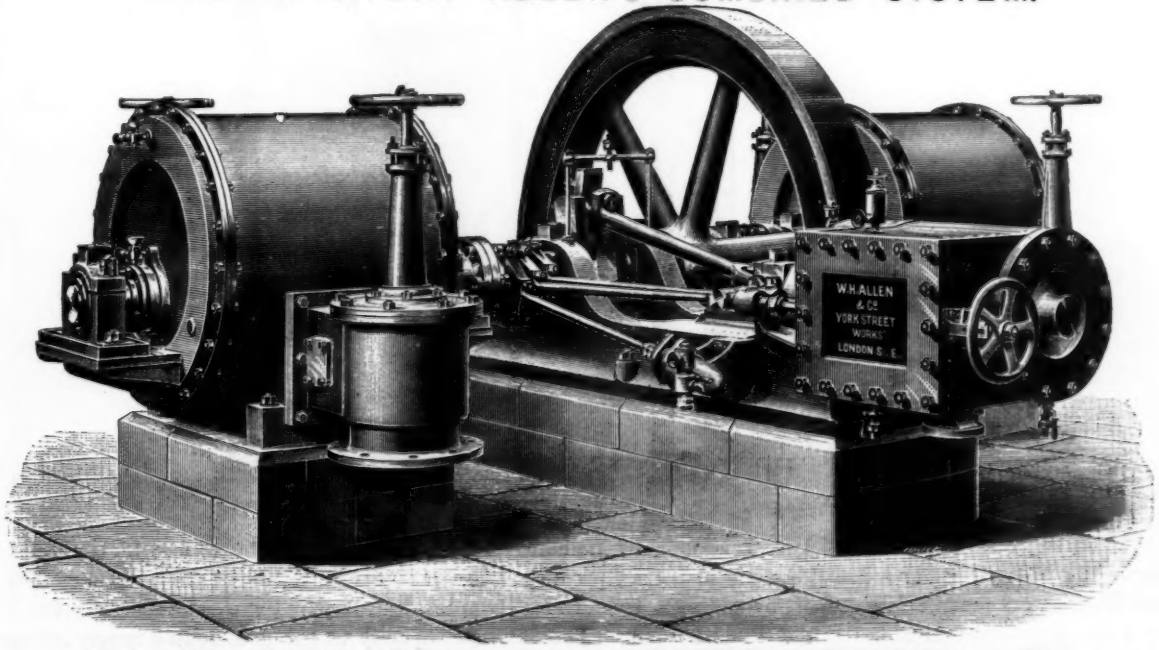
BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.
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CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

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☛ Retort Setters sent to any part of the Kingdom.

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GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

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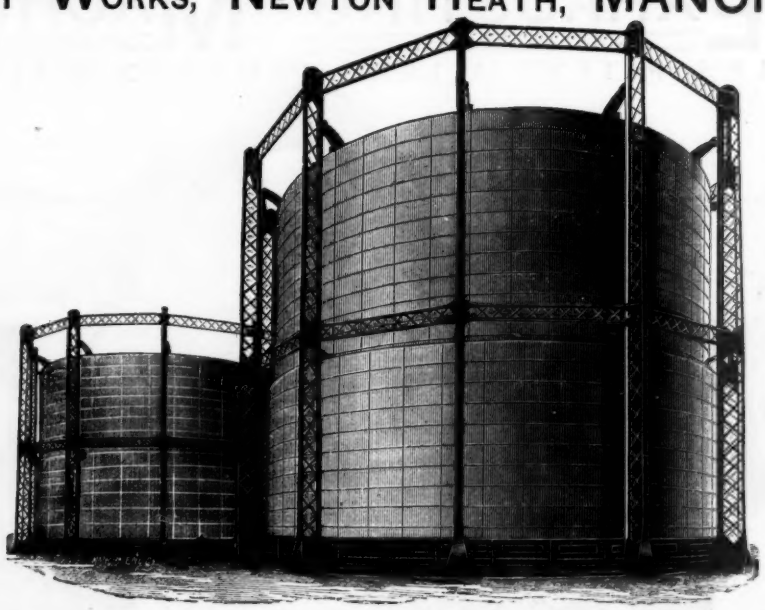

Illustration showing view of two Telescope Gasholders, each 65 feet diameter by 48 feet high, recently erected by Messrs. R. and J. Dempster, in Tanks previously occupied by Single-lift Holders 20 feet deep. The Tanks were made 4 feet deeper, by adding a Tier of Cast-Iron Plates, prepared with suitable Flanges, to meet the Brickwork of a Brick and Puddle Tank. The storeage capacity was thus increased nearly 150 per cent. at comparatively little outlay.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

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SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

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CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
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And to the following Gas Companies and Corporations:—

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HALIFAX.
ALTRINCHAM.
DENTON.
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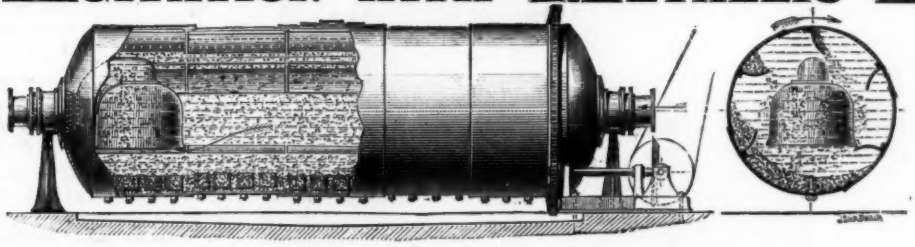
THE REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY. REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

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OF ALL FORMS & SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

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WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,

TABLE GLASS OF ALL KINDS,

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MODERATOR LAMPS.

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SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS,

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

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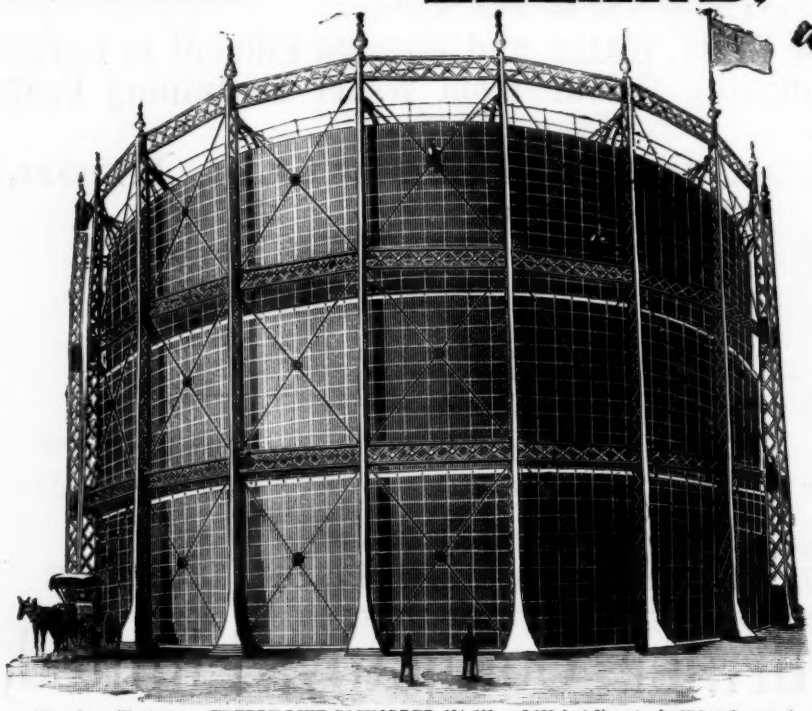
ROSE MOUNT GAS ENGINEERING WORKS,

ESTABLISHED — ELLAND, — 1855.



The above illustrates a TREBLE-LIFT GASHOLDER, 194, 191, and 188 feet diameter by 35 feet deep each, as made for the MELBOURNE (Australia) GAS COMPANY.

GAS AND CHEMICAL PLANT OF EVERY DESCRIPTION — ALL SUNDRIES SUPPLIED.

OUR

ROTARY — EXHAUSTERS

Are acknowledged to excel in efficiency and finish.

OUR IMPROVED

COKE-BREAKING — MACHINE

Is a pronounced success.

See Last Week's Issue.

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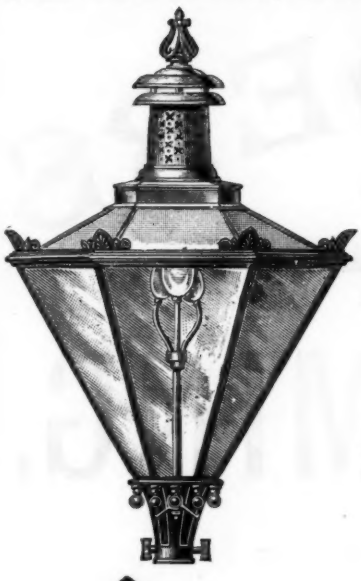
D. HULETT & CO., LIMITED,

GAS ENGINEERS,

55 and 56, High Holborn, London,

MANUFACTURERS OF EVERY DESCRIPTION OF GAS-FITTINGS,

GAS-METERS, GAS-LAMPS, GOVERNORS, ETC.



HIGH-POWER LAMPS

OF THE MOST IMPROVED CONSTRUCTION.

STRONG COPPER TOPS.

PATENT GOVERNOR BURNERS,

Giving from 16 to 450 Candle Power.

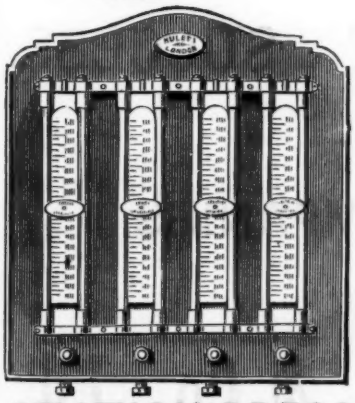
D. HULETT & Co., Limited,

Invite Gas Companies and Local Authorities to compare the Quality of these Lamps with other Makers'.

PATENT STREET LAMPS.

NO PUTTY REQUIRED.

Several thousands of these have been made, and are giving every satisfaction. New Glass can be inserted in a few minutes by any inexperienced person.



HULETT'S

Patent Service Cleanser,

FOR REMOVING OBSTRUCTIONS IN SERVICE-PIPES AND MAINS.

No Gas Company should be without this Valuable Invention.

PATENT STREET LAMP GOVERNORS.

STATION PRESSURE GAUGES, on Enamelled Iron Plates.

WROUGHT AND CAST IRON TUBES AND FITTINGS.

GREAT SAVING IN COST.

GASHOLDERS WITHOUT GUIDE-FRAMING.

PEASE'S WIRE-ROPE SYSTEM.

EQUALLY APPLICABLE TO NEW AND ENLARGED HOLDERS.

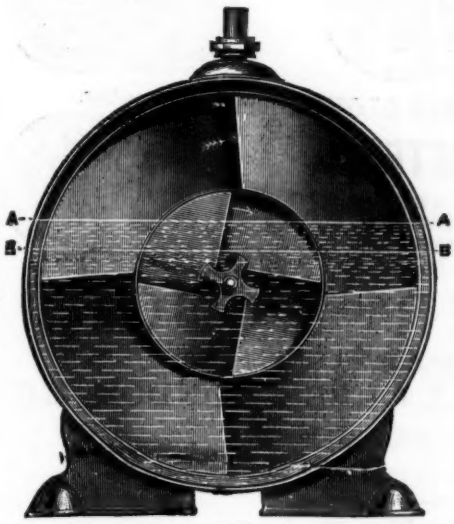
APPLIED WITH PERFECT SUCCESS.

ADOPTED BY THREE COMPANIES.

ASHMORE, BENSON, PEASE, & Co., Ld.,

STOCKTON-ON-TEES.

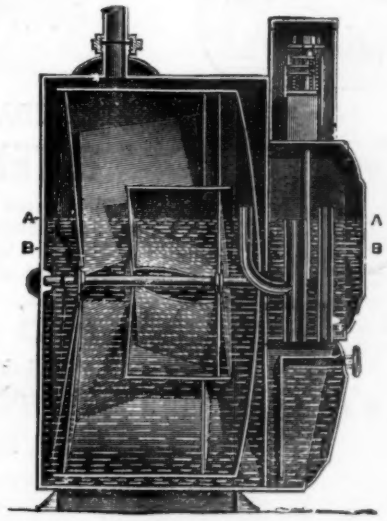
THE WARNER AND COWAN METER.



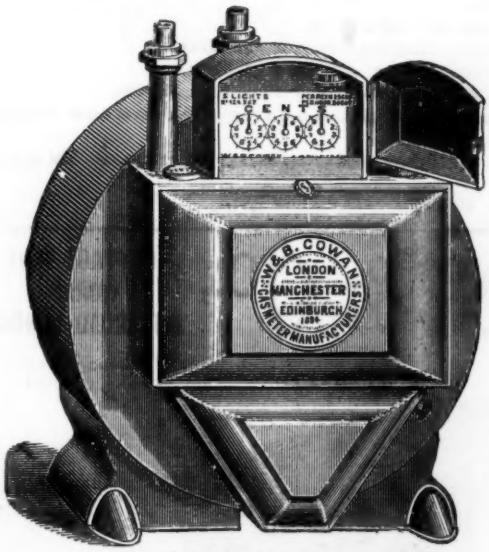
A A, High-Water Line.

B B, Low-Water Line.

Drum in Case. Hollow Cover removed.



Sectional Side View of Meter.



Elevation showing Tin Case Meter.

Elevation showing Cast-Iron Case Meter.

In its completeness as a measure, the WARNER AND COWAN drum differs from every other. Of definite capacity, irrespective of the water-line, it can neither be over nor under filled, but discharges at each revolution the same volume of gas.

It is to this also that its secondary, though important, advantage is due—viz., the long float-range which this drum permits.

The illustrations show front and side views of the drum, and also views of the complete meter—both in tin and cast-iron case.

The drum being of fixed capacity within itself, the extraneous mechanism and arrangements are of the most simple character. These include all that is necessary, but exclude all that would be superfluous.

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER, LONDON, S.W.

DUTTON STREET WORKS, MANCHESTER.

BUCCLEUCH STREET WORKS, EDINBURGH.

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867. Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

W. PARKINSON & Co.,

COTTAGE LANE WORKS, CITY ROAD, LONDON.

TELEGRAPHIC ADDRESS: "INDEX LONDON."

NEW DESIGN STATION METER (No. 2 PATTERN).

W. PARKINSON & CO. have introduced the above design of Station Meter in order to meet the demand for a more ornamental Tank. It is simpler in construction than No. 1 Pattern, and consequently less in cost. All joints are planed, the most modern improvements introduced, and the entire Meter is of the strongest and most substantial description.

FITTED WITH

PARKINSON'S PATENT THREE-PARTITION MEASURING DRUM.

MATERIALS and WORKMANSHIP of the VERY BEST QUALITY ONLY. PRICES, &c., ON APPLICATION.

Highest Award, Melbourne Exhibition.

[See also Advt., p. 572.

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 25, 1890.

The Termination of the Coal Miners' Strike.

THE great coal strike has come to an end, precisely as we anticipated would be the case, by the surrender of the coal-owners to their men. Everything that has been remarked in these columns with reference to the irrationality of most labour squabbles in the coal trade is therefore justified once more. A fortnight ago the JOURNAL was almost alone in protesting against the way in which the general trade of the country was threatened with dislocation, simply because the two parties to the getting of coal in a large portion of the kingdom could not come to an agreement over a question of wages. This time, however, warned by their experience of eighteen months before, the Press was shy of siding with the masters, and was by no means disposed to accept as conclusive their asseverations that they could not grant the advance demanded by the men. Twice within eighteen months the coal-owners of the Lancashire, Yorkshire, and Midland districts have put the country to all the trouble and loss of preparing for a coal famine, only to give in a day or two after their men had proved their sincerity by bringing their tools out of the workings. It is little better than child's play; and, as the *Standard*—one of the staunchest supporters of capital and of old-fashioned ideas of allowing masters and men to settle their own difficulties left in these days of mounting Socialism—truly says, the employers ought to have done at first what they did at last, and so avoided teaching their men the pernicious lesson that pressure will always gain its object. The same organ tells the coal-owners in plain language that they cannot expect to be believed again when they assert their inability to concede advances of pay. Of course, there is something to be said on the other side. The masters may argue that it is just as well to put the men to a little trouble in a matter of this kind, in order that they may not run away with the notion of always being able to ask for an advance one day and have it the next. Again, all this disturbance means higher prices for coal; and owners may have hoped to find coal worth more when the men started again than it was when they stopped. True, the pits that have kept working will reap more advantage from this consideration than those from which no coal has been raised for a week; but it may be taken for granted that the consumer will, as usual, be expected to pay the miners' advance several times over.

It is this reflection that embitters the public, in their capacity of coal consumers, against the whole order of those through whom filters the money paid for fuel on its way to the working miner. If coal-owners are maligned, they have themselves to thank for it, when gas companies, corporations, railway, steamship, manufacturing, and other wholesale consumers of coal unite for once with the private householder in complaints of the whole system of which the recent strike was such a damaging exposure. What a disconcerting incident it has been to the thick-and-thin advocates of old-established Individualism, and the unrestricted play, in industrial matters, of the recognized principles of Political Economy! The Socialist may well laugh at the fatuity of his opponents, who are never weary of proclaiming the superiority of private trading to organized national undertakings, while he asks in what respects the common sense and justice of the existing system of working the nation's coal capital have been displayed by the past week's doings. He would say: "Let "us suppose the coalfields to be worked by a Government "Department, like the Post Office. Under these con-"ditions, would such a ridiculous exhibition be possible?" In point of fact, a strike is an act of industrial war; and it is a disgrace to our civilization that, in an age when what the law-books recognize as private war is treated as an offence against the common weal, something quite as bad may be precipitated at any moment, by the ignorance, obstinacy, greed, or folly of people in trade. It is reported that a working basis has been agreed upon by the parties to the late strike, which will prevent similar disputes in the future; we devoutly hope the news may be true. It can only be want of faith that has stood in the way of such an arrangement in the past. If a good scheme can be determined upon and agreed to in cool blood, a great responsibility will rest upon the side that shall rupture the mutual understanding without a cause such as public opinion can accept as valid.

There should be comparatively little difficulty in striking a balance between the interests of employers and employed in such an industry as coal mining, wherein the product is one commodity always sold for prices capable of verification. Moreover, restless as the men appear to be while they labour under the thought that, for every sixpence of additional pay they receive, the public pay half-a-crown or thereabouts, they know that a point exists at which their labour would become too costly for their employers. Their leaders are astute, and have deserved their confidence, inasmuch as on two successive occasions they have forced the employers to grant advances such as they considered

were warranted by the state of trade. The credit in these affairs has remained wholly with the men and their leaders; and we have no hesitation in admitting the fact. Strikes are a barbarous way of adjusting labour disputes; but the discredit of causing them nearly always rests with the vanquished. A strike that is unsuccessful is always looked upon as unnecessary; a concession won by workmen after a strike is regarded as a tribute to their sincerity. It will be very surprising if the coal miners, hitherto led with so much ability, make a blunder at last, and formulate a demand which the employers are really and truly unable to grant. Their business is in the hands of men who know what can and what cannot be done, and not in those of empty demagogues. If self-assertion and incapacity ever take lessons to themselves, the contrast between the miners' and the gas workers' strikes ought not to be lost.

There are many morals to be found in the tale of the recent labour troubles, for masters (if the word is not obsolete) and men, and also for the community at large. It is the public who pay for all in the end. When a nation goes to war, it is the stay-at-home taxpayer who has to find the money, and who suffers on this account as much in his degree as the private soldier in the trenches. So when capital and labour fall out, it is the consumer who bears the loss, and is directly interested, although in the second line, in all propositions for the prevention of industrial conflicts, or for reducing them to the smallest range while diminishing their virulence. Among all the clamouring in the newspapers and from platforms that has attended these strikes, an observer has been able all the time to distinguish three voices, proclaiming as many different policies for the regulation of the relations between employers and workmen. The first and noisiest is that of the Trades Unionist, who declares that the employer is the natural enemy of the workman. The right course for the latter to follow, according to this counsel, is to do as little as possible for the highest rate of wages he can force his employer to pay. This is the gospel of the *Labour Elector:* The shorter the day, the more men must be employed. To this the logical development must be given that the less every man does for his money in his working hours, the greater benefactor he is to his kind, because the more will be wanted. Truly, a hitherto strange standard of duty; but one lives and learns. Of course, the consideration of the degree of laziness that can safely be imported into any class of work without killing it, never troubles these publicists. All this is for the employer and his foremen to see to. The next voice that makes itself heard above the din is that of the orthodox Economist, who holds up the teaching of history and experience against the hare-brained ravings of the Jack Cades of the platform and the press. At the time when the original Mr. Cade started on his reforming mission, he had not the advantage of newspapers and Trades Union congresses wherein to ventilate his notions about passing an Act of Parliament for causing the pint measure to hold a quart, and making it "felony to drink small beer." Like most men in advance of his age, Cade was knocked on the head by unappreciative Authority; but his immortal principles may be read in modern guise in more than one "labour organ." It is these that give the Political Economist his advantage; and he has the force of use and wont on his side, when he urges the workman to return to his duty, and let the value of his labour be adjusted to the condition of the market in the old way. Thirdly, there is heard even more and more convincingly, as it appears, the voice that urges the forging of a fresh and strong bond between the worker and the capitalist, so that these two shall be friends, and not enemies. Time was when buyer and seller were regarded as foes. "It is naught, saith the "buyer; but when he is gone on his way, then he boasteth." The maxim *caveat emptor* also testifies to the existence of this ancient view of the essential antagonism between the two parties to a bargain. We can now see that this view was erroneous in principle, however justly it might describe the personal dispositions of the parties; because we have risen to the conception of the abstract idea of Commerce, to which both buying and selling, producing and consuming, are necessary. It is perceived that the seller is necessary to the buyer, and *vice versâ;* and that according to the degree in which these inseparables realize their mutual relations as being friendly or hostile, so will the Commerce which embraces the sum of their transactions be honest, civilizing, and prosperous, or tricky, barbarous, and unfruitful. As in commerce, so in industry. The Trades Unionist, with his counsels of enmity between the orders of industry, is in the barbarian's state of mental culture. He sees that individual representatives of the two principal orders occasionally fall out; and immediately jumps to the obvious, but imperfect conclusion that these conflicts result from the nature of their relationship. The need of the day, therefore, is to remove this false theory of industry by erecting a new and true one. The only fault of the old principles of Political Economy is that they did not go far enough in recognizing men as men, but left them as money-making machines. To enlarge these principles, therefore, without running counter to the truths of experience, is the task of the Economist of the future, whose work should be facilitated by the teaching of this winter's strikes.

The London County Council and the Late Gas Stokers' Strike.

THE recorded deficiencies of the South Metropolitan Company's gas, in respect of illuminating power, pressure, and purity, during and in consequence of the stokers' strike, came before the London County Council last Tuesday, on the report of the Sanitary and General Purposes Committee. The facts will be found with all necessary fulness in another column. The only point on which the Council could hang a discussion was the propriety of the finding of the Chief Gas Examiner that the deficiencies in question were due to an unavoidable cause. Consequently, the Council fastened on this point, which gave the notorious Mr. John Burns an opportunity for appearing in his favourite character of Champion Demagogue. This was very magnanimous of him, because the stokers said unkind things about him and other professional agitators during the strike, which they rudely refused to entrust to his management. He appeared to forget all this, and assured the Council of his positive conviction that the South Metropolitan strike was not unavoidable, but was undertaken deliberately by the Company in consequence of a private quarrel with their men. Furthermore, Mr. Burns went on to remark that the County Council ought to "insert a strike clause in their contracts with Gas Com-"panies." What should be, in Mr. Burns's opinion, the purport of such a clause in such a connection did not transpire; but evidently it would be something altogether different, if he had the drafting of it, from the measure of relief from contracts and statutory obligations which usually passes under the same name. To judge from Mr. Burns's recorded sayings and doings, he regards striking as the noblest action a nominally working man can perform. When the working man intermits working with striking, it also follows, from Mr. Burns's ordinary proceedings, that he holds with the removal of all police and military forces to a safe distance, lest the worker, or rather striker, should be tempted to hurt himself against truncheons, bayonets, and similar unpleasant appanages of an effete social system. Consequently, one would expect Mr. Burns's model strike clause in the agreements of the London County Council with Gas Companies to run somewhat as follows:—"Pro-"vided always that if the men employed by the Gas "Company at any time think fit to strike, and the Com-"pany do not instantly consent to whatever terms they "may propose for resuming work, so that the Company "are thereby prevented from carrying out their engage-"ments under this agreement and the Acts of Parliament "prescribing the illuminating power, pressure, and purity "of the gas to be supplied in the Company's district, such "failure shall not be deemed to have arisen from an "unavoidable cause, but shall render the Company liable "to the penalties enacted for deficiencies in the above-"mentioned respects." And to these penalties a special fine might be added. However, on the present occasion Mr. Burns was quietly informed that his oratory was wasted, inasmuch as the Council had no power over the Chief Gas Examiner, so as to bend his discretion to its will. Consequently, the Chairman (Lord Rosebery) pulled the Council down to the region of law and fact; and the report of the Committee was forthwith adopted.

The Meeting of the Eastern Counties Association.

THE members of the Eastern Counties Association of Gas Managers met on Wednesday last in Peterborough, under the presidency of Mr. John Barton, Engineer of the Peterborough Gas Company. The presidential address was well suited to the occasion and the audience, and did not suffer

in interest from coming after so many other compositions of the kind that have lately filled our columns. It is perfectly natural that the first meeting for the year of these District Associations comes to be regarded as the annual one, whereat the President's Inaugural Address should be delivered in due form; but probably if a Committee of Presidents of these societies could be formed for the settlement of matters of this kind, in which there is a risk of clashing, some of them would prefer to make their formal speeches at a season of the year when they would be less crowded by others. The business programme of the meeting included a paper by Mr. W. Drewry, of Cleethorpes, on "Experience with Subsided Mains," which dealt in a practical way with a subject in which many managers of gas-works serving districts having an alluvial subsoil, or troubled with mining or brine-pumping enterprises, have only too close an interest. The meeting was altogether a very pleasant and successful one.

The Massachusetts Gas Commission on Water Gas.

THE wisdom of granting certificates for the distribution of water gas containing a high percentage of carbonic oxide exercises the minds of the Massachusetts Board of Gas and Electric Light Commissioners; and they have accordingly asked the State Legislature to alter the form of these licences. At present the law requires the licences to state that the gas to which it applies "can be used with "safety," which means binding the Commissioners to an expression of opinion that would not serve for all users of the gas. As the Commissioners reasonably urge, safety in the use of any variety of illuminating gas depends more on the manner in which it is used and on the character of the consumer's fittings than on its chemical composition. All illuminating gas, even if made from coal, is more or less dangerous when improperly treated; and, similarly, careful treatment will render the most poisonous water gas innocuous. When producers and users of gas in a town prefer one variety to another, it is not merely because one contains half as much carbonic oxide as the other, but because it is brighter, cleaner, or cheaper. The risk of using any appliance of civilization is not the foremost thing that people think about. They look first to their own comfort and convenience; and then if it is ascertained that this is purchased at the price of a certain amount of care or vigilance, they will pay it so long as the burden is not too onerous. As a matter of fact, the Massachusetts Commissioners find that people in water-gas towns do not knowingly evince more care in their use of the commodity than is done in regard to coal gas; although it is considered that the supplying Company might, in the former case, exercise stricter powers of inspection. This conclusion is reasonable enough; and it is reassuring to find that the Commission are not able to support with fresh examples the "scare" that was created at one time over the deadly nature of water gas as distributed by the Companies. That there have been deaths, accidental and otherwise, clearly traceable to water gas distributed for illuminating purposes, the Commissioners do not deny; but they evidently think these casualties will bear explanation as well as enumeration.

The Secretaryship of the Bromley (Kent) Gas Company.—Our local Correspondent writes: "After a connection extending over 26 years, Mr. H. W. Amos has been appointed Secretary of the Bromley (Kent) Gas Company, in succession to Mr. G. H. Osborn, whose death was announced in the JOURNAL a fortnight ago." The appointment of Engineer and Manager of the works has not yet, we understand, been made.

The Electric Light in Madrid.—It appears that there is likely to be a sharp competition for the supply of the electric light in Madrid. Although the Electric Supply Company of Spain (whose head-quarters are in London) are vigorously pushing forward their works for supplying the city, another English organization—the Madrid and General Electric Supply Company—have also obtained permission to lay down underground wires.

Congratulations to Mr. G. Livesey.—At the recent half-yearly meeting of the Brighton and Hove Gas Company, a special resolution, moved by Mr. J. B. Paddon, and seconded by Mr. R. Hesketh Jones, was passed, expressing the cordial thanks of the meeting to Mr. G. Livesey, "for the important services rendered by him to the proprietors of gas undertakings generally, in his successful resistance to the recent strike at the South Metropolitan Gas-Works." The Secretary (Mr. W. H. Hardy) was instructed to forward a copy of the resolution to Mr. Livesey.

WATER AND SANITARY AFFAIRS.

THE anxiety manifested by some of the Metropolitan Vestries to prevent any accretion to the revenue of the London Water Companies by reason of the revision of the valuation lists indicates a sentiment which is making itself known here and there in the Provinces also. We hear that in some districts water consumers are still labouring under the impression that the decision of the House of Lords in the case of *Dobbs v. The Grand Junction Water-Works Company* has a far wider effect than can, properly speaking, be attributed to it. In this idea, they are more or less encouraged by the busybodies who constitute themselves Ratepayers' Associations or Committees of Vigilance in some of the larger towns, and whose existence, of course, is not justified unless they can discover and nurse a real or an imaginary grievance. It is very easy for people of this kind to addle their pates when they attempt to deal with a subject so complex as the law which regulates the payment of water-rates. It is to be borne in mind that the Special Acts of Parliament obtained by the Provincial Companies present great varieties of phraseology. It is this which makes it important to remember that the decision in the Dobbs case applied only to water-rates based on the terms of the Special Acts obtained by the Grand Junction Company. Moreover, nearly every case of water-rating that has come before the Courts has had reference to premises occupied by the owners themselves. The result is that there is very little encouragement for those who seek to place upon the word "rent," where it occurs in connection with water supply, a meaning foreign to that which reasonably belongs to it. In the case of the *Sheffield Water-Works Company v. Bennett* decided seventeen or eighteen years ago, and fully reported in the JOURNAL for July 2, 1872, the meaning of "rent" was very carefully considered by the Judges. It was explained by Baron Cleasby that the word could not signify strictly the rent actually or incidentally paid. In a row of houses, all of equal value, one might be let at only a nominal rent for family reasons, and the next might be let at a greatly reduced rent because the tenant had repaired the house himself or paid a premium; so that the rent actually paid in such cases could not be the absolute criterion contemplated by the Legislature. Bearing all this mind, however, Baron Cleasby went on to say that the word "rent" might generally be read to mean what the landlord gets as rent, although technically that is not its meaning; and if the landlord is obliged to pay the water-rate, all that he gets as rent, and all that ought to be taxed as rent, is the whole of the payment after deducting what he is obliged to pay. This is no doubt perfectly correct; and the same reasoning applies with equal force to the payments made for poor rates and district rates. It follows, therefore, that if this interpretais to be generally applied, the word "rent" in a Water-Works Act means the proper rent of a tenant paying the rates and charges usually paid by the tenant, and of which the actual rent that a tenant does pay who discharges these rates is, in general, the proper criterion. It may be deduced from this principle that where the word "rent" occurs in a Water Company's Special Act, it affords the strongest ground to the Company for contending that the water-rates are not to be assessed in accordance with the rateable value of a house, but rather upon what is known as the gross estimated rental. The gross estimated rental may be taken to represent what the tenant is prepared to pay to his landlord after taking into account the fact that he will have to bear poor rates, district rates, and other outgoings.

A "Limited" Association with rather a long name, and having for its object the protection of rate and tax payers "against unjust assessments and excessive taxation," held a meeting last week, of which we give a brief account in another column. The gathering took place in St. James's Hall, and was presided over by Mr. Keevil, in the absence of a more exalted individual, who was expected to take the chair. It will be seen that the Society which convened the meeting not only proposes certain changes in the mode of levying the income tax, the inhabited house duty, and parochial rates, but goes on to inveigh against the principle of charging for the water supply according to the rateable value of the premises to which the supply is laid on. The proceedings at the recent meeting commenced with a

concise paper read by Mr. J. J. Hitchings, an ex-Crown Surveyor, who holds the post of Managing Director to the Association. This gentleman's remarks concerning the charge for water were somewhat cursory; his main argument having reference to the mode of assessing income-tax. On this subject it was not difficult to show some very striking anomalies. The speakers who followed, while agreeing with Mr. Hitchings that there was something wrong in the system of Imperial taxation, were particularly eager in denouncing the Metropolitan Water Companies. If the arguments on this latter point were weak, the language was certainly strong. Thus the present system of charging for water was declared to be "a most "hideous thing," and altogether "abominable." Bad as the income-tax might be, the water-rate as levied by the Companies was thought to be something even worse. It is curious that there was no one to speak a word on behalf of the small occupier. The "bitter cry" came from the occupants of large dwellings, and the tenants of highly rented offices and shops, or else was uttered in their name. There were dolorous complaints on behalf of individuals who calculated that each time they washed their hands it cost them from a sovereign up to fifty pounds. Of course these gentlemen could, if they would, wash their hands a little oftener, and so bring down the price *pro ratâ*. Apparently it never occurred to anyone to suggest that if the rich thus paid largely for their water supply, the working classes and the poor obtained their supply so much the cheaper. The Legislature in past years saw fit to provide that the consumers of water should contribute to the cost in accordanee with their ability, and not merely on the scale of their necessity. That the present plan yields "large profits" to the Companies is not altogether true, for dividends vary, and there was a time when they fell much below their present level. If the profits are so large, why has there not been greater promptitude in buying up the Companies, and making the revenue from the water supply auxiliary to the general rates? At the St. James's Hall meeting there was the usual contention that the supply of water ought to be by meter. Mr. W. H. Lefevre, while denouncing the existing water-rates, very candidly stated that there was no meter known that would register correctly under varying pressures. This was disputed by another gentleman, who it appeared had "put a fair amount of money "into a meter," but could find no market for it. Of course, it will be a grand day for meter-makers when supply by meter is made universal by Act of Parliament. But if anything could rob the water supply of its sanitary character, a meterage charge would most assuredly produce that result. One fact which leaked out in the course of the discussion deserves recognition. In the City, the authorities do all in their power to keep down the assessment. At the West End the authorities are "not so wise." The latter, it is said, keep up their assessments so as to make the rates seem low. In the City, we presume, the authorities keep the assessments down, in order to baulk the New River Company. Let the assessment be what it may, in the City or in the West End, the Water Companies are simply charging as the law directs; and it must not be forgotten that it has been in reliance on the law that the Companies have expended their capital.

Gas and Electric Lighting in Melbourne.—At the half-yearly general meeting of the Metropolitan Gas Company of Melbourne, held on Jan. 28, the amount standing at the credit of the net revenue account was shown to be £115,676. Out of this £20,000 was taken for the reserve fund; and a dividend at the rate of 19½ per cent. per annum absorbed £68,952—leaving £26,724 to be carried forward. In the twelve months from January, 1889, to January, 1890, there have been two reductions in price—viz., in July last of 4d., and at the end of the year of 5d. per 1000 cubic feet—making the present price (4s. 7d.) the lowest of any in the Colonies. In their report, the Directors remarked that, as the suburbs become settled, so does the supply of gas follow, and the further piping of outlying districts would be undertaken as circumstances indicated. But with the rapid rate of reduction they had been able to make, increased consumption would be required to maintain the advantage to the shareholders as well as to the public. In this connection, it may be mentioned that the Municipality of Richmond, one of the suburbs of Melbourne, have just decided to light the streets by electricity; and if the experiment should prove successful, other districts may follow their example. But electric lighting undertakings do not seem to flourish in the colony, for the *Melbourne Argus* reports that the Victorian Schanschieff Electric Light and Power Company, Limited, has gone into liquidation.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 588.)

It is impossible to note any improvement in the state of business on the Stock Exchange; week after week in monotonous succession ruling flat and depressed. To the disturbing element of the coal strike was added the resignation of Prince Bismarck; and these two combined factors oppressed the markets so that nothing could move. Business in general has thus been much restricted; and though before the close of the week the incubus of the coal strike had been removed, and German affairs were considered to be marching satisfactorily, yet the markets hardly revived at all. It is possible, however, to look for some improvement when this account is over, if no new bother supervenes, and if the influence of the Easter holidays be not too potent. The Gas Market has been very fairly active, all things considered; but the course of prices has been somewhat irregular. Gaslight "A" opened rather weaker, and, in anticipation of coaling troubles, had fallen 4 by Thursday—marking as low as 246. But by Saturday it was up again to 249½. Still, the quotation on balance has receded 3. The other issues were active and rather stronger. Business in South Metropolitans has been much more lively, and the stocks are in fairly good demand. Transactions in Commercial have been more frequent, and the price of the old stock is slowly creeping up. It will bear a good bit more raising yet. Extreme quietude prevails among the Suburban and Provincial Companies; and the only move is a further advance in Brentfords, of 2 each. Among the Foreign undertakings, Imperial Continental maintained its advance very well—changing hands more than once at 221, in the earlier portion of the week. But later on there was some appearance of a disposition to realize profits. Continental Union, European, and Buenos Ayres have been well supported. Water stocks show no improvement upon the position of the preceding week. East London was offered, and closed 1½ lower; and Southwark has receded again.

The daily operations were: Monday's Gas business was nearly all in Gaslight "A" and Imperial Continental. The latter was firm; but the former fell back 1. Brentford old advanced 2; and ditto new, 1. Water was very quiet; and Southwark was lower. On Tuesday, there was more activity in Gas; but prices were irregular. Gaslight "A" lost 2; but all other stocks dealt in commanded good figures. Water offered nothing for remark. Transactions in Gas were rather more restricted on Wednesday. Prices, however, were steadier; and Commercial old advanced 1. Water was decidedly weak; but quotations were allowed to remain unchanged. On Thursday, Gaslight "A" was at its lowest point; falling 1 more. Other issues, however, were tolerably well supported. In Water, East London was flat; and the price fell 1½. On Friday the Gas market showed a more favourable tendency; but the quotations did not move. Water was not remarkable. The tone of the Gas market was better still on Saturday. Gaslight "A" recovered 1; and South Metropolitans realized good figures. Nothing in Water was touched, except East London, which closed without further change.

ELECTRIC LIGHTING MEMORANDA.

The Lease System for Municipal Electric Lighting Undertakings—The Fire Risks of Electric Lighting—Electric Arc v. Gas Lighting.

As stated in the Journal last week, the Association of Municipal Corporations have prevailed upon Mr. Calcraft, of the Board of Trade, to so far modify the Model Electric Lighting Order as to allow Local Authorities obtaining these Orders to delegate their powers to Companies. This means that, if possible, the leasing system is to be invoked for the development of electric lighting, just as was formerly the case in regard to gas undertakings. It is impossible to object in principle to this modification of the working of the Electric Lighting Acts, while reserving judgment as to how the division of responsibility is in practice likely to act. Some such arrangement was certainly called for by the peculiar circumstances of Local Authorities in their present action under the Acts in question. Threatened with inroads by half-a-dozen speculative Companies, the majority of Municipal Corporations have appealed to the Board of Trade for Provisional Orders purely in self-defence. Few of them have a real intention of carrying out electric lighting works; but they have gone through the form of scheduling their A and B districts of supply, and done all that was otherwise necessary as a preliminary to securing the powers under the Acts which would preserve the integrity of their streets from the House-to-House and other privateers of electric lighting. In two years, if these powers are not exercised, they will lapse; but a reprieve of even two years is worth buying at the cost of a Provisional Order. Now, however, by the modification of the terms of these Orders obtained by the Associated Corporations, many that would otherwise have remained a dead letter may be utilized. Of course, objection has been raised, ostensibly in the interest of the electric lighting industry, to the relief in question; but the complaint comes from the least respectable class of self-styled electricians—speculators who find their mouthpieces in blackmailing financial newspapers. Out of London there is scarcely a *bonâ fide* Electric Lighting Company with standing and means enough

to warrant a Local Authority in allowing it to occupy an urban district for 42 years. There may arise, however, many small local undertakers of electric lighting, if they can take the business in hand as lessees of established works and mains. What the electricians want most at present is a Croll to teach them a good working system. The Corporations will be able, within the period of their Orders, to make subways, lay copper mains, purchase station sites, erect buildings, and put down steam plant under the direction of qualified consulting engineers. If these establishments are then let on lease to responsible men of business, it will soon be seen whether there is any trade in this particular line.

An "accident" that happened a few days ago in a Vienna theatre caused the *St. James's Gazette* to remark that "we have not yet mastered the little idiosyncrasies of the electric light." It is recorded that the india-rubber insulation of an electric light wire inside the theatre took fire, and immediately large flakes and drops of the material fell blazing upon the stage. The house being crowded, there was, of course, a panic; but through the composure and presence of mind of some of the audience, the terror was stayed, after a couple of hundred people had rushed, with more or less damage to themselves, to the exits. The fire being at a point of the wiring where the surroundings happened to be uninflammable, it did not spread from the place of its origin; and the burning material luckily fell harmless to the floor. It is unnecessary to remark how narrow a chance separated this "accident" from a horrible disaster. The newspaper already quoted from, in commenting upon the incident, observes that "no doubt we shall in time learn how to diminish the dangers of electricity; in the meantime, the chief obstacle to the spread of electric lighting seems to be the uncertainty and danger of the electric light itself." This is a great deal for a newspaper to state in disparagement of the "light of the future." There is no doubt, however, that many people are seriously concerned about these reports of the danger to life and property in connection with electric light wires. They begin to understand that the risk in this case occurs at a different point to that at which gas becomes something to take care of. Electricians have shown, by breaking incandescent lamps in contact with lace curtains, &c., without igniting these materials, that this means of lighting is different in this respect from gas. Consequently, the public came to think that the electric light was necessarily much safer that gas. It is now perceived that the danger of electric lighting is not at the lamp, but may be manifested anywhere on the line of the conducting wires. These must be insulated; and the awkward part of this requirement lies in the fact that the best insulator is a highly inflammable substance—india-rubber. So long as the wire remains perfect in size and shape, and is not overcharged with electricity, india-rubber is the best of all known coatings for keeping the electricity from escaping from the conducting metal. Once allow the same wire to be pinched by a careless workman, either at the time of fixing or afterwards, while doing something to the wall on or in which the conductor is laid; or once let an excessive electrical pressure find a way to the conductor, and the coating which was the preservative becomes the source of danger. The wire heats, the insulation takes fire, and possibly the building which contains it is burnt to the ground.

According to a report mentioned and discussed in the *Electrical Review* an inventor has brought out an arc lamp in which a hydrocarbon vapour is employed in conjunction with the carbon arc, with, it is claimed, a considerable enhancement of illuminating power. This is something like carburetting the arc, just as a gas-flame is carburetted in the albo-carbon system of lighting. How the idea may work remains to be seen; but our contemporary evidently does not think much of it. The arc lamp is very tantalizing to electricians. It gives, for the force expended, the best photometrical result of any known form of electric light; but it is not susceptible of subdivision to a manageable size; and it flickers. Electricians claim (and our contemporary supports the claim) that they can supply arc lighting at a cost equivalent to that of gas at 1s. per 1000 cubic feet. The comparison really ought to be with outdoor oil-lamps of the Lucigen type, and not with gas, which costs no more for use in the smallest burners than in high-power lamps. When this can be said of electricity applied in the form of arc lamps, these may be compared in cost with gas; not before.

The Electric Lighting Scheme for the City of London.—At the last meeting of the Commissioners of Sewers of the City of London, a report was presented by the Streets Committee relative to the proposed contracts with the Brush Electrical Engineering Company and the Laing, Wharton, and Down Construction Syndicate; but it was considered in private.

The Possible Existence of Natural Gas and Oil beneath the British Salt Measures.—The Salt Union have decided to put to the drill test the theory enunciated by Mr. B. H. Thwaite, in his lectures on "Gaseous Fuel," as to the existence of natural gas and oil beneath the British salt measures, at depths varying from 3000 to 4000 feet. If Mr. Thwaite's theory is proved to be correct, it will have an enormous influence in developing the industries in the North, and in the application of oil and gaseous fuel for industrial uses, in place of fuel of a solid character.

SUGGESTIONS FOR THE GAS MAKER.

THERE are several systems of gas making actually in the field which the gas engineer who desires to keep abreast of the times cannot afford to ignore, whatever may be his opinion of their intrinsic values. The recent strike of coal miners in the Lancashire and Yorkshire and Midland districts, following upon the labour troubles of the past winter, has been to many gas managers and their employers very much what the Gordon Riots were to Dickens's Gabriel Varden. They have upset the monotony of their lives; and in more than one "Sleepy Hollow" of the gas industry the tremendous question has been asked, "What should we do if we could not depend upon the coal supply, and the men broke out at the same time?" Of course, it is not to be supposed that the danger of running short at once of material and men is at the present moment imminent in the gas industry, or that it is likely to become so under existing conditions. The alarmists' view of a possibility is always a distorted one; and we have no desire to take it. At the same time it must be conceded that the dull days of stagnation of trade—when men came begging for employment, and coal-owners would cut each other's throats for gas contracts—seem to have terminated for the moment; so that with regard to their raw material many gas managers have lately had a closer view of a positive scarcity than they would have dreamt of as possible a year or two ago. Consequently, the mere routineer in gas making has been shaken out of his complacency, wherever the spirit of routine has not so prevailed over everything that its victim has been contented with the thought that if coal and labour failed the district would have perforce to be put in the dark. Happily, however, this last virtue of resignation to the apparently inevitable has not recommended itself to all gas managers, many of whom are not of the sort of man who easily confesses to being beaten. Consequently, merely as a matter of precaution, these indomitable spirits have begun to cast about for a "second string" in case the first should snap.

The next best material to coal for gas making is undoubtedly petroleum; and closely allied to mineral oil is the shale from which paraffin oil may be extracted. Quite recently an inventor has tried to do something with oil gas of a quality too rich to be burnt in the ordinary way. We used to hear more about mineral oil gas requiring to be diluted with air, in the days before Mr. Lowe made water gas commercially successful in the United States. The drawback to this class of illuminating gas was that a very little air made a great difference in the illuminating value of the mixture; and consequently the pure oil gas, rich as it was, would not bear dilution. Now the same idea has been revived, with the difference that a small percentage of oxygen, rendered available by Mr. W. A. Valon's adaptation of the Brin process, is to be mixed with the rich gas, in order to render it readily combustible. Students of our "Register of Patents" will have noticed a couple of months ago that a Mr. S. Tatham has patented a notion of this kind, for what he has called "carburetted oxygen" gas. Now, we have not the least desire to discourage anybody who thinks to improve coal gas or oil gas as a fuel or as a means of lighting; but it must occur to the veriest tyro in chemistry that "carburetted oxygen" gas might very easily become a ticklish compound to approach with a naked light. Mr. Tatham contemplates adding 2½ per cent. of oxygen to 16-candle gas; but this would scarcely be a profitable thing to do. If anywhere, the profit would be found in mixing oxygen with very much richer gases; but the more oxygen the greater danger. It is not, of course, that a hydrocarbon gas to which oxygen is added in the proportions contemplated by Mr. Tatham is in itself a dangerous compound. Supposing the mixture to be perfect, to stand without stratification, and travel without separation, it is conceivable that the addition of 10 or 12 per cent. of oxygen to a heavy hydrocarbon gas would appear like a great improvement to the latter. The question arises, however, as to the sufficiency of the margin of safety in such a case. Is it impossible that somewhere or somehow the oxygen and hydrocarbon would bear to each other a hazardous ratio? Brin's oxygen process is now so pretty, in a technical sense, and its possibilities are so vague, that one is naturally indisposed to allow any application of it to pass unchallenged when it seems to lead to unnecessary risks. Plenty of uses for oxygen, to which no exception can be taken, will no doubt be found in time; but it will be necessary to make sure of the stages of any project for mixing it with hydrocarbon gas with a view to burning both from one orifice.

Water gas continues to occupy a tentative position in this country. It has transpired that the Meeze process, which Mr. G. C. Trewby seemed to think rather well of when he saw it in America, is practically identical with the Avery gas process, which did not precisely carry conviction to all observers of its trial at Cleckheaton. It is being tried again in the Chartered works—of course at the expense of the projectors; but it is too soon to say with what result. The Van Steenbergh experimental works at Knightsbridge are now trying what can be done with Russian petroleum of 40° Beaumé (or ·829 sp. gr.) and common gas coke. The working of this plant must be allowed to be simplicity itself. The tall "coffee-pot" generator already described in these pages is almost filled with coke, which is "blown up" by means of an air-blast for about 20 minutes, until the sight-holes show the interior to be a mass of white-hot carbon. Then steam at 100 lbs. pressure, dried by passing it

through a superheater coil exposed to the heat of a slow coke fire, is injected under the grate; and at the same time a supply of petroleum from an elevated tank is admitted through pipes to the middle of the contents of the producer, and the exhauster started at top speed. After a quarter of an hour of this, the test-burner begins to be smoky; showing that the process of reduction has gone far enough. Then the very deliberate attendant changes the process to "blowing up" again, and so with alternate stages of gas making and blowing the holder rises. The consumption of petroleum, costing 4d. per gallon, is somewhere about 3 gallons per 1000 cubic feet of 22-candle gas; but as these experiments with comparatively heavy oil are not complete, it will not be safe to say much about weights and quantities. Leaving these for the moment, the most striking features of water-gas making to anyone accustomed to the hard work and noise of a coal-gas works is the practical disappearance of the labour question. A quarter of an hour suffices to make between 2000 and 3000 cubic feet of gas at Knightsbridge, when there is an equal period appropriated to "blowing up," during which the same man might attend to a couple of other producers. There is no clinkering—the steam neutralizing this part of the furnace work; and consequently the stoker and the fireman disappear, to make room for a calm, intelligent mechanic, "clothed and in his right mind," and quite competent to tell when he is well off.

Besides the proposed utilization of petroleum in water-gas manufacture, it is employed, so it is said, to improve the illuminating form of coal gas where cannel is short or a specially good make is desired. This is done in the most successful example, it is reported, by Mr. R. Good, of Carshalton, who injects a little petroleum into his retorts when the charge of coal has been half burnt off. It is not the first time that petroleum has been used to improve gas as made in the ordinary way; but the peculiarity of Mr. Good's arrangement is that the addition is made upon the coal when it is in a peculiarly fit condition to receive it.

All these evidences clearly go to show that gas engineers need not sit down and despair because of incidental troubles from without or within the works. Resourceful men make difficulties their opportunities, and feel in rising to the occasion during a period of trial, a satisfaction not to be eclipsed by the sluggish contentment of ordinary experience, when the calm surface of routine working is unruffled by a ripple.

Liquid Fuel.—At the meeting of the University College Engineering Society last Wednesday, a paper on the above subject was read by Mr. P. T. J. Estler. After briefly referring to the various sources of liquid fuel and their probable duration, the author passed on to consider their chemical nature and their calorific value; showing how they have an advantage over coal. The three methods of burning liquid fuel were then described—differing according as the fuel was burnt as liquid, gas, or spray. The inefficiencies and difficulties attending the first two methods were shown; whilst the third, in which the fuel is fed into the furnace as spray by injecting air or steam, was fully described and illustrated. The author then passed on to consider the advantages of liquid fuel for boilers and metallurgical processes—viz., convenience of transport and storeage, decrease in number and labour of stokers, increase in evaporative power, ease of regulation, and absence of smoke, clinker, and sulphur. The deoxidizing action of the flame was shown to be useful in many cases. These advantages were illustrated by descriptions of the rivet-heaters used on the Forth Bridge, and other appliances.

The Salford Corporation and Mr. Ellis Lever.—The action brought by the Salford Corporation against Mr. Ellis Lever to recover damages for alleged fraudulent misrepresentation, which it was arranged should be tried at the present Leeds Assizes, was mentioned to Mr. Justice Day at the opening of the Civil Court on the 15th inst., and, to suit the convenience of Counsel and parties, the hearing was fixed for to-day. For some weeks past, however, Mr. Lever's health has been such as to cause considerable anxiety to his family and friends; and early last week he became so much worse that he was confined to his bed at the First Avenue Hotel, London, where he was staying. On Wednesday Dr. Broadbent was called in; and on Friday Sir Dyke Duckworth, M.D., visited Mr. Lever in conjunction with his medical attendant. His malady exhibited symptons of *angina pectoris;* and consequently any excitement would be likely to be dangerous. It was therefore deemed advisable to remove the patient to a private institution, where perfect rest and quiet could be ensured, with the advantage of the assistance of trained nurses. In view of Mr. Lever's condition, application was made to Mr. Justice Day last Wednesday for a postponement of the case until the next Assizes. It was, however, opposed by the plaintiffs' Counsel (Mr. Gould), on the ground that it had only been made to obtain further delay; and he pointed out that, in consequence of the interrogatories which have passed between the parties, Mr. Lever will not be a necessary witness in the case. In the result, his Lordship refused to grant the application; and condemned the defendant in costs. It is reported that whenever the case comes on, the Judge will be asked to conduct the proceedings in private—the press as well as the general public to be excluded. The convict Hunter has been taken to Leeds in anticipation of the action. His passage through Rochdale, where he was at one time engaged, excited a great deal of curiosity. He is stated to be in fairly good health.

NOTES.

The Fixation of Atmospheric Nitrogen in Gas Purifiers.

The subject of the fixation of atmospheric nitrogen in the forms of cyanogen and ammonia compounds is likely to attract an increasing amount of attention in connection with the employment of air to assist in the purification of coal gas. Many attempts have been made to produce cyanides directly from atmospheric nitrogen, as well as to obtain ammonia from the same source; but all manufacturing processes specially designed for this purpose have failed commercially, although some have attained experimental success. Yet cyanides are constantly being formed incidentally to furnace operations, and where alkalized carbon at a high heat is exposed to air and steam. Under such conditions, at a low heat, the nitrogen may be fixed as ammonia, and at a high heat as a cyanide. It is a question how far the reactions that go on inside an oxide of iron gas purifier include the fixation of atmospheric nitrogen; but cyanides and ferro-cyanides are being manufactured in Germany from the spent oxide of gas-works with which probably air has not been used. There are gas-works in the United Kingdom where 3 per cent. of air and upwards is admitted into oxide purifiers for the sake of revivifying the purifying material *in situ*. It would be interesting to know whether, and if so under what conditions, any of the nitrogen of this air is fixed in the material as cyanides or as ammonia.

The Unreliability of Cup Anemometers.

In connection with the exhibition of the Royal Meteorological Society, now open, it is interesting to observe that the report on the working of the Bidston Observatory for the past five years confirms the suspicion relative to the trustworthiness of cup anemometers which engineers have for some time entertained. It has been customary to compute the velocity of wind, from the indication of anemometers of this form, on the assumption that the rate of motion of the semi-circular cups of these instruments is equal to one-third of the velocity of the air. Investigations conducted by Sir G. Stokes tend to show that the constant for the cups is not 3 as supposed, but more nearly 2·4; and experiments by Dines establish the velocity and the pressure of wind to be $P = V^2 \times 0{\cdot}0035$, instead of the ratio hitherto taken, $P = V^2 \times 0{\cdot}005$. The maximum wind velocity measured at Bidston during the last five years was on Jan. 23, 1884, when, according to the gauges, it reached 78 miles per hour, with a corresponding pressure of 70·2 lbs. per square foot. On several other occasions an average pressure of 40 lbs. per square foot was recorded, accompanying hourly velocities averaging 64 miles. If the constant for the velocity must be reduced from 3 to 2·4, this 64 miles becomes, as *Engineering* has pointed out, 51 miles. According to the old formula, the corresponding pressure to 51 miles an hour would be 13 lbs., and according to the new formula only 9 lbs. per square foot, which numbers are in startling contrast to the 40 lbs. of the foregoing statement. Conversely, accepting the statement of the average pressure, the corresponding wind velocities would be 90 miles per hour by the old, and 108 miles per hour by the new formula, instead of the 64 miles recorded. Hence, whichever way the data are considered, the results are eminently unsatisfactory; and the inference is that the instruments employed are unreliable.

The Phenomenon of Phosphorescence.

In all complete scientific investigations of artificial illuminants the phenomenon of phosphorescence attracts a due share of attention; for although the absolute amount of light radiated from known phosphorescent substances is never great, the amount of effort or waste apparently spent in producing this luminous effect is so small that it has seemed to many investigators an interesting problem. It has been thought that if the radiation of phosphorescent substances could be increased sufficiently to be of practical use for any other service than rendering itself visible in the dark, this might be the most economical way of obtaining artificial light. Professor E. T. Thorpe has been lecturing at the Royal Institution on this subject. He has experimented with phosphorescent substances in order to ascertain the physical basis of the phenomenon, and has discovered that there is nothing special or abnormal about the glow of phosphorus; this being a quality which the element in question, which has furnished the popular name of the phenomenon, shares with other substances. Professor Thorpe therefore suggests that the term "glow" should be applied to the phenomenon in order to get rid of the association with phosphorus, which seems to limit ideas in connection with the effect. Unfortunately for this suggestion, the word "glow" already has a meaning which may be expressed by the synonym incandescence, and is applied to a phenomenon displayed by highly-heated bodies. It would therefore appear that, to use the well-known word "glow" in a fresh special sense, to mean what is generally recognized under the name of phosphorescence, would only be to escape from harmless confusion with regard to the origin of a phenomenon, at the risk of falling into a graver one with regard to its nature. Professor Thorpe finds the luminosity of phosphorus in the dark to be connected with the formation of a new oxide of the element, which has something to do with the production of ozone. This chemical effect, however, does not explain the similar phenomenon manifested by rubies, diamonds, and other substances, which Professor Thorpe demonstrated at the Royal Institution.

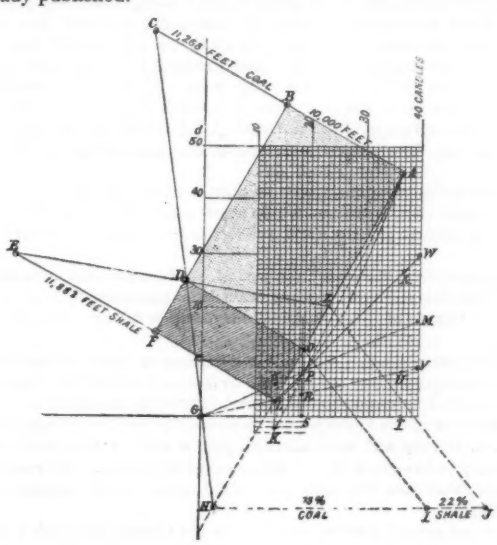
COMMUNICATED ARTICLE.

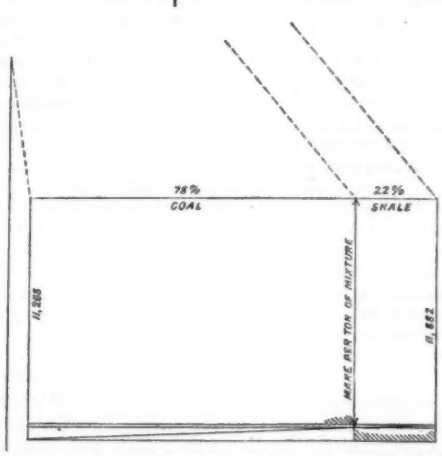
THE VALUATION OF COAL AND CANNEL.

By D. A. Graham,
Engineer and Manager of the Dunedin (N.Z.) Corporation Gas-Works.

It is now a number of years since I contributed several articles to the JOURNAL, treating of the comparative commercial values of gas coals and cannels. In the communication I now forward you, I desire to illustrate certain views I have already published elsewhere, relative to certain matters connected with the valuing and the selecting of coals and cannels for gas manufacturing purposes, which I have reason to believe have not always received that amount of consideration which I think they deserve.

In illustration of these principles I have selected two coals and a shale as examples. I have, in fact, given you a copy of the diagram which has decided our next year's contracts. It will be seen that I here use a form of diagram which appears (or will appear) in the next edition of "The Comparative Commercial Values of Gas Coals and Cannels"—not differing in principle, but only in arrangement, from the diagram I have already published there, but which some might prefer to the diagram already published.





Lines are constructed as before to represent candles, and pence as before, on which the co-ordinate values are laid off. Thus—

I. A mixture of the three coals raised at Greymouth, N.Z., were on the average found to produce 10,800 cubic feet of 18½-candle gas, 14¼ gallons of tar, 10½ gallons of ammonia water, and 1328 lbs. of coke. The residuals of the mixture of coals, I value as under:

	s.	d.
14¼ gallons of tar, at 4½d.	5	5
1328 lbs. of coke, at 25s. per ton	14	9¾
10½ gallons of ammonia water, at ¼d.	0	2½
Residuals worth	20	5½

The contract price for this mixture of coals is 27s. 9d., delivered; and 27s. 9d. less 20s. 5½d. amounts to 7s. 3¾d., which represents the cost of the gas produced. This divided by the make (10,800 feet), gives 8·12d. as the cost per 1000 feet of the 18½-candle gas that this mixture of coal produces. These results are laid off upon the diagram. The question then is, Can 18½-candle gas (the quality supplied) be made cheaper from a mixture of the shale and the other coal?

II. The best Newcastle (N.S.W.) coal—the Stockton—produces 11,268 cubic feet of 13½-candle gas, 1343 lbs. of coke, 12½ gallons of tar, and 12 gallons of ammonia water.

	s.	d.
1343 lbs. of coke, at 25s. per ton	14	11¾
12½ gallons of tar, at 4½d.	4	8½
12 gallons of ammonia water, at ¼d.	0	3
Residuals worth	19	11
Difference in carbonizing, &c., expenses	0	6
	20	5

And this coal is offered at 23s. 3d. per ton. So that 23s. 3d. less 20s. 5d., or 2s. 10d. represents the cost of the gas it produces; and this divided by the make (11,268 feet) gives 3·01d. as the cost per 1000 feet of this 13½-candle gas. These results are also depicted on the diagram.

III. The Australian (Sydney) Company's shale produces 11,882 cubic feet of 36·9-candle gas, 560 lbs. of useless coke, and 79 gallons of oil; and it costs 75s. per ton delivered.

	s.	d.
79 gallons of oil, at 4½d.	29	7½
Difference in carbonizing, &c., expenses	0	8
	30	3½

And 75s., less 30s. 3½d. amounts to 44s. 8½d., and which divided by the make (11·882 cubic feet) gives 45·15d. as the cost of this 36·9-candle gas per 1000 feet. This result is also laid off on the diagram.

Now, if coals and cannels and shales were sold according to their intrinsic values for gas manufacturing purposes (which is not the case), and if the gas produced from the Stockton coal was taken as a standard for measuring the commercial value of the gas produced from the other coal and shale, then the line C V, up to 40 candles, would cut off the proportional values per 1000 feet for all intermediate qualities—the value of the Greymouth mixture being reduced from P to R, and of the shale from A to H. But the coal market conforms to no such mathematical considerations; and at the rates quoted, it will be evident upon a perusal of the diagram that 18½-candle gas can be manufactured at a less cost (about 5d. per 1000 feet) from the Greymouth mixture than from a mixture of 22 per cent. of Sydney shale and 78 per cent. of Newcastle coal. There can be no doubt that the Australian coal is relatively the cheaper article for gas manufacturing purposes; but when it is to be used to manufacture a percentage of 18½-candle gas along with this shale, then the excessive value of the gas the shale produces per 1000 feet makes the cost of the mixture exceed the cost of the gas produced from a coal, the cost of the gas produced from which is excessive as compared with the cost per 1000 feet of the gas produced from the Newcastle coal, although it will be observed that the intermediate value forms a curve A P L, which would seem to indicate that as the productions and illuminating powers increase, more than proportional values must at present be paid for materials giving high illuminating powers.

Had the cost of the gas produced from the shale been f — T, instead of A T, then the cost of manufacturing gas per 1000 feet would have been the same as it would cost if made from the Greymouth coal; or had the Australian coal been sold for such a price as that the gas would have cost *minus* K pence, then the 18½-candle gas the mixture of coal and shale produced would cost no more than that produced from a relatively higher priced coal. But in each case the values would all lie in a straight line. Hence it will be seen that, although the Greymouth coals were relatively proportionally dearer than the Newcastle coal; nevertheless the cheapest 18½-candle gas could be made from the proportionally dearer material. Further, it will be seen that had a proportional mode of valuing been used to obtain the value of the Greymouth coal from the Newcastle coal unit, the Greymouth coal would have been rejected, although when 18½-candle gas is manufactured from it, it costs about 5d. less per 1000 cubic feet.

The Management of the Horsham Gas Company.—At the last meeting of the Horsham Gas Company, the shareholders had the gratification of receiving the full statutory dividend of 10 per cent. The satisfactory position of the undertaking of which this is a witness is due in a large measure to the careful supervision of the works by the Engineer and Manager (Mr. E. D. Sapey), who in the 5½ years he has been with the Company, has enabled the Directors to gradually raise the dividend 2½ per cent., and they have just shown their appreciation of his services by increasing his salary by £50 per annum.

The Gas Supply of Montreal.—According to the *American Manufacturer*, a Bill is to be presented to the Canadian Legislature for the purpose of incorporating a Company, under the title of the Montreal Gas Consumers' Company, for the purpose of establishing, maintaining, and carrying on in that city, works for the manufacture of gas, and for its introduction into all houses, shops, stores, workshops, and factories, for lighting, heating, or any other purposes. The capital of the Company is to be $3,000,000, with power to increase it to $6,000,000, The Company are to apply for the exclusive power to furnish gas during the space of 20 years, conditionally upon immediately reducing the price.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Half-Yearly Meeting of this Association was held last Wednesday, in the Gas Company's Offices at Peterborough (in which city the Society was brought into existence eighteen months ago). At the commencement of the business, Mr. W. BARRATT (Grantham), the retiring President, occupied the chair.

MINUTES OF THE LAST MEETING.

The HON. SECRETARY (Mr. H. Wimhurst, of Sleaford) first read the minutes of the meeting held in September last at Ipswich.

On the motion of the PRESIDENT, seconded by Mr. T. GREAVES (Melton Mowbray), the minutes were passed.

A WELCOME FROM THE CHAIRMAN OF THE GAS COMPANY.

The PRESIDENT said that he was pleased to see the Chairman of the Peterborough Gas Company (Mr. William Harris) present. He need hardly tell the members that the position of a chairman of a gas company was, as a rule, not a very easy one, and the Gas Company in that city was no exception to the rule. From a number of quarters, difficulties sprang up which a manager—no matter how good he might be—could not carry out or cope with if it were not for a good chairman. The chairman and the manager must go hand in hand, if they intended to succeed. What a chairman suggested, the manager should endeavour to carry out; and what a manager proposed, the chairman, if he be a wise man, would fall in with. He held that every gas company ought to give their manager full opportunity of developing all that he had in him, and to pay him well. Then, if he did not succeed, he should be sent about his business. He had no doubt that the Chairman of the Peterborough Gas Company was imbued with a feeling of this description; and that Mr. Barton and he got on well together. He (the President) was aware that the Peterborough Gas Company had their difficulties. He knew, from information received from a private source, that there were people who would undermine their constitution—perhaps because they did not think they obtained their gas cheap enough. The Chairman of the Company deserved all praise as well as the Manager; for they appeared to be working hand in hand. He had great pleasure in introducing Mr. Harris to the members.

Mr. HARRIS said he was not qualified to say a great deal in an assembly of gas managers; but he was much obliged to the President for the way in which he had referred to him personally. In the course of his 21 years' connection with the Peterborough Gas Company, he had had to deal with three different Managers—Mr. W. J. Moon, now of Scarborough; Mr. G. E. Stevenson, of Buenos Ayres; and Mr. J. Barton. During the whole of that period, there had never been the slightest hitch between the Manager and the Chairman of the Board. They were served faithfully by Mr. Moon and Mr. Stevenson; and no less faithfully for the past five years by Mr. Barton. The Company had had to pass through all the vicissitudes that most gas companies had to go through. They were planted in adversity; and they had grown up in storms. Just now they were in a state of calm; but they never knew when the next storm would break out. They had had their fightings without and fears within for many years; but in the midst of it all, they had grown and prospered, and the Company was never in a more satisfactory state than now. He must say that for gas managers the present was a very trying time. The labour conflict was a very serious thing for them; and in the coal strike there was danger—indeed, it would be exceedingly dangerous for gas companies if it continued for any length of time. However, he believed the public sympathy, in this instance, was against the men; and there did not appear to him to be any cause for the course the latter had taken. The men on strike were better off than half the tradesmen in the kingdom; and it was not a right thing for them to paralyze trade in the way they were doing. Such men as these, it was true, should be handsomely paid; and their hours should be short. Eight hours might be, and probably were, quite sufficient for anyone to be down 1100 feet below the surface of the earth. Gas stokers had to work rather hard; but they did not get one-half of the wages the miners did. He trusted the strike would soon be over; and hoped some plan would be adopted at the meeting to be held next day that would lead to the prevention of these strikes in the future. The strikers were doing an immense amount of mischief to the country; and unless some arrangement was speedily come to, the trade would go over to France, Germany, and elsewhere. Referring to the electric light, Mr. Harris remarked that he knew Mr. Jones, of Chesterfield, well, because many years ago he was in communication with his Chairman, on this subject. Mr. Jones, he believed, had the first fight that occurred in this country over the electric light; but he did not appear any the worse for it now. (Laughter.) The electric light never had any terror for him (Mr. Harris). As soon as it was introduced into London, he went and saw it—first at the Gaiety Theatre, then on the Thames Embankment, and at the Polytechnic. He came away with the full conviction that it could not do any harm to gas companies; and he was still of the opinion that neither oil nor the electric light would ever take the place of gas—at all events they had no fear of those two illuminants in that city. At the same time, they had not the number of gas consumers they ought to have. There were 4000 ratepayers; and only 1700 consumers. This, he did not think, was a fair proportion. However, it must be remembered that Peterborough covered a large area, that it was sparsely populated, and that a large part of the people were of the working class, who were not consumers of gas. And, under present circumstances, it was not desirable that they should be, unless some other system than quarterly bills could be arranged, because members of this class of the community occupied a house one week, and in a fortnight might be living in another part of the city, and the Company would have to hunt for them. Therefore he did not consider it desirable they should have a large accession of the working class as consumers. In conclusion, he said it would give his colleagues and himself great pleasure to hand over to the service of the Association the room in which they were assembled whenever they visited Peterborough.

FIRST ANNUAL REPORT.

On the motion of the PRESIDENT, seconded by Mr. C. E. JONES (Chesterfield), it was agreed to adopt and take as read the following report of the Committee:—

In presenting the first annual report to the Association, your Committee express their satisfaction at the progress made during their first year of office. Three meetings have been held during the year—the first preliminary, at Peterborough, in September, 1888; the first general meeting, at Grantham, last March; and the second general meeting, at Ipswich, in September last—the two general meetings being a pronounced success, due in a great measure to the able manner in which the President, Mr. W. Barratt, conducted the meetings, and to Mr. J. T. Jolliffe and his Directors for the great liberality which they showed to the members at the Ipswich meeting.

The number of members the Association started with was 25; 14 new members were elected during the year; and should the gentlemen to be proposed at the next general meeting be elected, the total number will then be 45.

The balance-sheet shows that £24 13s. 6d. has been received in subscriptions during the year; and the payments have amounted to £17 5s. 3d. —leaving a balance of £7 8s. 3d., and the outstanding subscriptions, of small amount.

The first general meeting was held at Grantham on March 20 last, when, after the usual preliminary business, the President delivered his Inaugural Address, which comprised subjects of great interest to the profession. On the completion of the business, the members, by the kind invitation of Messrs. R. Hornby and Sons, Limited, paid a visit to their well-known engineering works—much to the enjoyment of all present. The members and friends were then hospitably entertained to tea by the President and Mrs. Barratt.

The second general meeting was held in the Library of the Town Hall, Ipswich, by the kindness of the Mayor of Ipswich, on Sept. 18, under the presidency of Mr. W. Barratt, when, after the usual business, Mr. W. J. Best read a paper upon "Secondary Air Supply to Ordinary Retort-Settings," and Mr. J. Carter a paper upon "Some Reflections upon the Commercial Policy of a Gas Undertaking," which provoked good discussions. The members then adjourned to the Ipswich Gas-Works, which they inspected; afterwards taking a trip down the Orwell to Felixstowe, and back by train to Ipswich. During the evening the members were entertained at dinner by the Chairman and Directors of the Ipswich Gas Company.

The thanks of the Committee are due to those members who have so efficiently supported the Association by the reading of papers and in other forms, thereby rendering great service in promoting knowledge which must be of great benefit to the gas industry and profession generally.

The Committee hope that every member will use his influence on behalf of the Association, in the reading of papers, and inducing other gentlemen to join in the good work of the society by becoming members.

On behalf of the Committee,

H. WIMHURST, Hon. Sec. and Treasurer.

THE ADMISSION OF ASSISTANT MANAGERS AS MEMBERS.

The PRESIDENT remarked that the next matter for consideration was a proposal by the Committee that Rule 2 should be altered.

The HON. SECRETARY said the following was the minute on the subject passed by the Committee:—"That an alteration of Rule 2 be recommended to the next general meeting, that the words 'assistant manager' be inserted after the word 'managers.'" The rule would then read—"That this Association shall consist of engineers, managers, assistant managers, or secretaries, exclusively engaged upon gas-works, in the service of gas companies or local authorities."

The recommendation was adopted, without discussion, on the motion of the PRESIDENT, seconded by Mr. F. WELLER (Southtown, Yarmouth).

ELECTION OF NEW MEMBERS.

The SECRETARY said the Committee recommended for election as members of the Association the following gentlemen:—Mr. George Garnett, of Ryde; Mr. W. J. Carpenter, of Yarmouth; Mr. W. Duesbury, of Cambridge; Mr. J. S. Dougall, of Boston; Mr. C. Ellis, of Yarmouth; and Mr. J. N. Foster, of Skegness.

On the proposition of the PRESIDENT, seconded by Mr. JONES, these gentlemen were unanimously elected as members.

The Retiring President.

The President said that his term of office had now expired; and he had the greatest pleasure in introducing his successor. It was not necessary to say anything in regard to Mr. Barton; he was certain he would do his best to sustain the honour and dignity of the position to which he had been elected.

Mr. Barton, having taken the chair, said the first duty he had to perform in his new office was to propose that a very hearty vote of thanks be accorded to Mr. Barratt. They were all greatly indebted to him for the valuable service he had rendered as President to the Association during the past eighteen months. It was largely owing to his efforts and his vast experience that the Association had grown to the extent it had done in the short period of its existence.

Mr. Jones said that, as a friend of many years' standing of the retiring President, it afforded him much pleasure in seconding the proposition. In selecting the first President to guide the members in their deliberations, they made an excellent choice; for a great responsibility depended upon the few first Presidents, who had to shape the policy of the Association for time to come. That Mr. Barratt had brought his shrewd Yorkshire tact, his mature wisdom, strong common sense, kindness of feeling, and generosity to bear upon the work of the office, was so patent to them all that he need not further refer to him. They could only wish that as he retired from the chair, he would not allow the active interest he had taken in the welfare of the Association to abate.

The resolution was carried with applause.

Mr. Barratt, in reply, said he was exceedingly obliged to the President and Mr. Jones for the way in which they had spoken of him. He did not know that a man could have a better companion than a clear conscience; and when the members elected him as President, he made up his mind to do his duty, and, if possible, to make the Association a success. This he had endeavoured to carry out. Of the Secretary he could not say too much; and as to the members, he had received from them all nothing but kindness.

The President then read the following

Inaugural Address.

Gentlemen,—I thank you for the honour you have conferred upon me by electing me President of this Association; and much as I appreciate that honour, I cannot refrain from saying I would have preferred that it had fallen upon someone better able than myself to deal with, and place before you, the important events that have taken place in connection with our industry since our last meeting. I confess that I feel very diffident in addressing you, following so closely as I do such an able and experienced President as our esteemed friend Mr. Barratt; and further, it is rather a difficult matter to select anything really new, when so many scientific papers place before us weekly all the discoveries and improvements that are continually occurring, and these in their turn are further discussed at the many useful Association meetings of our profession.

We have met together to-day for the object of adding to our store of knowledge, to enable us to provide for the inhabitants of this country one of the best and most useful means of artificial lighting and heating; and also that we may still further promote the best interests of the undertakings in our charge, to the benefit of our employers and consumers alike. In order that we may gain the object we have in view, let us for a few moments examine ourselves on one or two of the many questions incidental to our industry.

Most of us are compelled by our Acts of Parliament to supply gas of a given quality; but I am not aware that we are restricted to any particular kind of gas, so long as the illuminating power of what we supply is equal to our statutory obligations. Up to the present, we have contented ourselves by supplying coal gas; and so long as we can obtain such an excellent supply of coal and cannel as at present, we need not fear any rival. Neither is there any cause for alarm at any diminution in our coal supply, because we have it on record, by many eminent authorities, that the duration of the coal supply of the British Isles will last for many generations to come; and recently we have been informed that other coal-fields have been discovered, which must be the means of prolonging the life of our coal supply. But the most troublesome element at present existing in connection with our coal supply, is the uncertainty of the price. The sudden and unexpected increases, which no doubt all of us have recently experienced, are very misleading to us.

When the price begins to go up, no one knows apparently when it is going to stop. This places us in a very awkward position, because with cheap coal we get to a great extent cheap gas; and owing to the general depression in trade during the past 15 years, coals have been supplied to gas authorities at exceedingly low prices, which has had the effect of cheapening the gas, and in some towns most favourably situated to a very low figure indeed, so much so that the sudden and unexpected advances that have recently occurred, have placed such authorities in most unpleasant positions, causing a very considerable increase in the cost of producing the gas, and in many cases very great loss. It is a very easy matter for the colliery proprietors to put up the price of coal a few shillings per ton when the demand warrants it; but it is a very difficult matter for gas authorities to put a few pence on the price of gas to compensate them for the unexpected and unavoidable increase in their expenses.

We have had from time to time, and have at the present moment before us, several schemes for enriching the quality of gas made from ordinary coal; and although there is a great diversity of opinion as to the merits or demerits of these differents systems (and they may not be all that is desired), yet I think they are steps in the right direction, and ought not to be neglected.

There can be no question that there is considerable room for improvement in our present mode of carbonization. The system of to-day is slow, wasteful, troublesome, and costly. Machines for facilitating this work have been invented and tried; but I am sorry to say that they have not so far proved sufficiently successful to bring them into general use. I will not say that they are failures; but they are certainly open to great improvement, and to my mind must be made with less complicated machinery before they will meet with general favour. As soon as this is done, then, I think, mechanical stoking will compete successfully with the present system of hand labour.

The question of retorts and retort-settings is another very important branch of our industry. Is it not lamentable to find that, in these days of scientific knowledge, we have nearly as many different kinds of retorts and settings in use as we have days in the year? Cannot something be done to bring about a uniformity in size and shape to suit the different works, according to the quantity of gas made? I feel sure if a serious effort was made in this direction, with the assistance of retort makers, an improvement might be effected, with the result that these goods would be supplied cheaper, and no doubt better, than they are at the present time. Almost every engineer has his own particular size and shape of retort and method of setting, from which no doubt he gets very excellent results, and consequently has no desire to make a change. But if the same good results could be obtained from other settings of a general character, and with uniformity, I am convinced it would be better for all concerned.

Take an instance: How much more economical it would be for manufacturers to be in a position to make retorts for—say six—different works in any one particular neighbourhood of one uniform size and shape. If this was possible, is it not reasonable to expect that they would be supplied cheaper, and I venture to say better, than they would be were they to make for the same works retorts of six different sizes and shapes, as is now the case? It may be argued that, owing to the great competition in the fire-clay trade, good retorts of any size can be bought at a reasonable price already; and I quite agree that they can. But if we could adopt a standard size (if only to suit the requirements of our own neighbourhood, in connection even with this Association), we should command greater consideration, with the result that we should be supplied cheaper and with greater promptitude. But as long as there is such a variety of sizes and diversity of opinion, it cannot be said that we are working on the most economical lines, or securing all the advantages that it is possible to get. I do not say that such a change can be effected all at once. It must be a question of time. But we want a beginning; and, if practicable, I should like very much to see a Committee appointed from the members of this Association to investigate this question, so far as it relates to our own district, and if it were taken up by other District Associations in a similar manner, some very important and useful information might be gathered from it.

I am pleased to find that some attempts are being made to bring about a reform in our system of retort-settings; and in passing I would refer to the arrangement adopted by M. Coze, of setting the retorts in an inclined position, also to that of Mr. Elliott, of the Ludlow Gas-Works. I understand that the former system is being introduced, and is about to be tried in this country on a practical working scale. If successful (which I hope it will be), it must be one of the means of improving the present mode of retort-setting, and simplifying the work of the retort-house.

Actions speak louder than words; and I think recent events have proved to us that it is high time something was done to modify this work, as within the walls of the retort-house lies mainly the success or otherwise of our undertakings; and so long as the whole process is depending upon manual labour, many must be the difficulties and losses, as unless the operation is skilfully carried out in all its details, successful carbonization cannot be attained.

It is gratifying to observe that considerable progress is being made in the method of heating retorts by regeneration, or by a more simple and inexpensive means of introducing secondary air to the furnaces. Not only is this being done in large works, but also in smaller works, as was described by our friend Mr. Best at the last meeting of this Association. The results obtained by that gentleman are very encouraging, and such that should stimulate him and others to further research and investigation. It is of the utmost importance that the heat required for the perfect distillation of the coal should be produced and utilized in the most economical manner; and it is in practical experiments such as these that we must hope to reach that state of efficiency necessary in these days of keen competition. I may say that I have at work here at Peterborough, a very simple arrangement of admitting a supply of secondary air to the furnaces, which works very satisfactorily—securing a good

uniform heat to the retorts, and it also effects a considerable saving in fuel.

With high heats we often hear that great trouble is caused by what is commonly known as stopped ascension-pipes. This evil, I think, can be very easily overcome by paying due regard to the size of the retort, the ascension-pipes, the seal in the hydraulic main, the quantity of coal to be carbonized in each charge, and the time required for distillation. If these details are attended to, I am quite certain we shall have very little trouble or annoyance on that head.

Passing on to the important question of condensation, let me ask, Are our present forms of condensers correct? Are we able by these condensers to efficiently control the condensation so as to prevent loss of illuminating power through excessive condensation? Have these questions been determined with that degree of accuracy necessary to assure us that the changes taking place are regular and uniform under the varying circumstances? I am afraid not. Many are the secret changes (quietly, slowly, but constantly) taking place within these iron vessels, and adverse changes, ofttimes unknown to those in charge, which ought not to be. We all know that the gas must be condensed; but it is possible to do too much, or we may do too little, and what may be correct for one day or hour, may be altogether wrong for the next. Hence the difficulty. We have condensers in great variety; but I have not yet seen one that can be controlled to meet the sudden changes in the weather that frequently occur in this climate of ours both summer and winter. I am longing for the day to come when this problem, together with purification generally, will be thoroughly solved, and a scheme introduced whereby we shall be able to condense, wash, and purify coal gas, in closed vessels entirely, with a strict knowledge of what is actually taking place step by step, and sufficiently under command so that we can adapt the plant to meet the requirements of the day.

During the past few years the system of air or oxygen purification has been brought very prominently before us by gas engineers from different parts of the country, all of whom speak very highly of it, get satisfactory results, increase their yield of gas per ton of coal carbonized, reduce the cost of labour, and purify the gas to a state of purity never before realized. This is all very good; and from my own practical experience of the system, I can endorse all that has been said in its favour—my acquaintance with it being of many years' duration, and at a works making over 200 million cubic feet of gas annually. The gas at these works was purified on this system with only a change of purifiers when the oxide was fully charged with sulphur, and the illuminating power maintained to a standard of over 18 candles from ordinary Lancashire coal. I am therefore quite convinced that this is one great step forward in achieving continuous purification in closed vessels. The main object of this process is to effect a continuous revivification of the oxide *in situ*. This is accomplished by means of air being drawn or forced in at a suitable point, whereby it becomes carburetted before it enters the purifiers, thereby avoiding any loss in the illuminating power, whilst the oxygen in the air so drawn in is found to be perfectly efficient in keeping up constant revivification. I have known instances at the works already referred to where the purifiers have been charged with fresh oxide, and not again discharged until the material contained nearly 60 per cent. of sulphur. But I had better observe that this system was patented in 1881; and I believe the patent is still in force.

We have recently observed quite a new departure in the construction of gasholders. One has already been erected at the Northwich Gas-Works, on what is known as the spiral guide system (without columns), designed, I believe, by our friend Mr. Thomas Newbigging. Gasholders on this principle will, we are informed, cost considerably less than those supplied with columns in the ordinary way. Let us hope that this holder will be tested thoroughly, and that the experiment may be successful.

Several other matters closely identified with our manufacturing department are worthy of our serious consideration—notably, the best means of disposing of the surplus coke, tar, liquor, and the manufacture of sulphate of ammonia. But to go into these subjects in detail now would, I am afraid, only weary you; so I will leave them, and perhaps one of our members will favour us with a paper thereon at a future meeting. I wish to say, however, that I strongly advocate the manufacture of sulphate of ammonia, by all gas authorities who can by any means obtain a sufficient supply of ammoniacal liquor to keep a plant at work, if only during the winter months; as with judicious expenditure in plant, and careful management, the results from this source would prove a welcome addition to the receipts of such companies.

The importance of laying down mains and service-pipes in a thoroughly reliable manner, cannot be over-estimated; but as this is the subject of a paper to be read by Mr. Drewry, and discussed at this meeting, I will not trouble you with any details thereon.

How to popularize and extend the use of gas in these days of many rivals is a subject requiring very great attention; and I think the following points demand our earnest attention:—(1) The best means of securing consumers and extending the use of gas. (2) How to use the gas to the best advantage to satisfy and keep the consumer. (3) The collection of the accounts.

With regard to the first point, I think it is incumbent upon gas companies to abolish to the utmost extent the system of demanding a deposit or other security from the would-be consumer before he is allowed to have a supply of gas. Any charges for laying the service-pipe, fixing the meter, main tap, &c., should be kept down to the lowest point; and any internal fittings done by the Company should also be carried out at the lowest possible cost, as these preliminary charges doubtless prevent many becoming consumers. The sale of gas-fires at cost price, and the hiring out of gas-cookers, should be encouraged as much as possible. The introduction of small cooking-stoves among cottagers (who may not use gas for lighting purposes), at a small rental, might be introduced, and would be a sure means of increasing our sale of gas.

Secondly, endeavour to keep the illuminating power of the gas to a good and uniform quality. Recommend the most suitable burners for the quality of the gas supplied; and offer them to the consumers at cost price. It is well known by us all, that very often burners are used that are totally unsuited for the gas we supply; and, as a result, we get complaints saying that the gas is bad in some cases, and in others the gas bills are too heavy, which oftentimes cause the consumers to discontinue the use of gas. Therefore the question of burners is of vital importance to both the consumers and the company.

Thirdly, the present system of quarterly accounts and collections is certainly a great drawback to the use of gas among the working class; and if some mode for weekly or fortnightly payment could be introduced, I am satisfied it would meet with approval, and be attended with success.

The prepayment meter system no doubt meets the case to a certain extent; but from information I have been able to obtain on the subject, I find that there is considerable objection to it on account of the gas supply being suddenly cut off when the prepayment has not been made. No doubt it may be argued that such consumers have no right to expect a supply of gas unless payment has been made; and very properly so too. But there may be times when the matter would be overlooked; and for these people to be thrown into sudden darkness must be very unpleasant.

I consider that more frequent collections and the ordinary meter is far better, and would meet with more general approval; or what I think would be still better, is for gas companies to establish receiving offices, the same as the post office authorities do, by arranging with suitable tradespeople in various parts of the town, to receive monies on their behalf, where the weekly or fortnightly consumers would be expected to call and pay sums equal to the quantity of gas they would burn. The collector could call at these district offices at suitable intervals to receive the amounts paid, and look up those consumers who may be in arrear. I certainly think an experiment of this kind is worth a trial, and would be a means of popularizing the use of gas among the working classes. It would also prevent the unpleasantness previously referred to; and I think be found very economical to work.

Before leaving this subject, I may add that I have taken out a number of consumers in Peterborough, such as would come under this class. I find their average consumption last year was 5575 cubic feet, say 6000 cubic feet. This at 3s. 4d. per 1000 feet, together with the rent of the meter at 4s. per annum, amounts to 24s., or 5½d. per week. This is a very small sum, and would never be felt by the consumers if paid weekly or fortnightly. Therefore, if some good system could be devised for accomplishing this, depend upon it a very large number of these people would become consumers.

Although the demand for gas continues to increase, still we have considerable opposition. We have to contend against cheap oil with its improved lamps, electricity, and water gas. With regard to oil, I do not think we have much to fear, notwithstanding its cheapness, &c. It has become our greatest opponent, not that it is cheaper than gas, but because the consumers can purchase in small quantities as they require it; consequently they do not feel the cost. The demand for the electric light teaches us, I think, that it is not a question of cheap light, but more light that is desired, which, of course, can be had from gas by the use of suitable burners, and at considerably less cost.

While we are prepared to admit that considerable progress has been made in the production of this light, it does not seem to interfere in any way with the demand for gas, nor does it appear likely to do so. There seems to be very considerable danger attending the escape of the electric current along the line of wire. Indeed, the number of fatal accidents due to this is somewhat alarming. The Mayor of New York, who, I believe, has had considerable experience in electricity, has declared it as his opinion that overhead wires, carrying powerful currents, cannot be made permanently safe; and Mr. Edison (the great electrician) says that wires for conveying high tension currents, or currents of the alternating character laid underground, would be altogether a mistake. He argues, that if we mean to be safe, we must altogether prohibit the transmission of currents known to be dangerous, and that no system of insulation will long control a high tension current, however clever the contrivance may be, and that high potential and alternating currents conveyed beneath the surface may travel along in company with the gas, or water, or re-appear at the coal traps, or at the ventilating gratings. Wherever there is metal, there

these currents may take their course; and as a result of this, we are told that domestic servants may be killed by placing their hand on the water-tap, visitors drop dead while ringing the door-bell, and pedestrians treading on a grating may be struck senseless. Such are the predictions of a master in the electric art; and recent calamities have proved, I think, beyond doubt, that such is the case.

When reading an estimate in the JOURNAL OF GAS LIGHTING for Jan. 28 last, prepared by Professor H. Robinson, M. Inst. C.E., for an installation of electric lighting for the St. Pancras Vestry, I was very much struck by the enormous capital required for simply supplying and laying the underground mains. This gentleman's estimate (which was based upon provisional tenders obtained), for 6 miles of mains is £16,710, and 10 per cent. for contingencies (£1671), make a total of £18,381; being at the rate of £3063 10s. per mile. Taking these figures as a basis, it would cost £75,587 10s. to provide mains alone to supply a district such as Peterborough; being an amount very nearly equal to the total capital of the Gas Company. And as the cost of the mains is only about one-third the capital needed to equip an electric light installation, the total capital required to light Peterborough would not be less than £226,762 10s. The interest on this capital, together with the enormous wear and tear to the machinery, and the working expenses, must form a very great obstacle to the electric light ever competing successfully with gas. At present I believe the comparative cost of this light is about three times the cost of gas, light for light.

With reference to water gas, I do not look upon this as an opponent to coal gas, because if it is found necessary, or that it will best answer the purpose of gas companies to make this kind of gas, I am not aware that there is anything to prevent them doing so.

I feel I cannot close this address without briefly referring to the labour disputes that have recently taken place in connection with some of our large works. The South London gas strike has undoubtedly been the event of the day; and for a time it occupied much of the public mind, coming as it did in the depth of winter. The workmen there, no doubt encouraged by the success of the strike at Bristol, assumed an attitude of determined opposition to a scheme, which, I feel sure, was planned in all good faith for the purpose of binding closer that feeling of friendship which should always exist between employer and employee; but it does seem sad that men in this age should allow themselves to be led by strangers and unscrupulous agitators into conflict with their employers, such as we have recently experienced—bringing misery upon themselves and families, which by a more prudent course on their part might easily be prevented. I certainly feel that we owe a debt of gratitude to the Chairman of the South Metropolitan Gas Company, Mr. George Livesey, for the just and successful stand he made against the demands of trades' unionism during the recent strike.

In conclusion, Gentlemen, I wish to express my satisfaction with the progress this Association has made during its short career; and I feel sure that, with the united efforts of its members, the good work so well begun will continue to prosper.

The HON. SECRETARY proposed that the thanks of the meeting be given to the President for his interesting and able address.

Mr. A. J. YORSTON (Ely) seconded the proposition, which met with the hearty approval of the members.

The PRESIDENT, in acknowledging the vote, said if there was anything in the address which would be beneficial to the members, he should be amply repaid for the trouble he had been put to in its preparation.

EXPERIENCE WITH SUBSIDED GAS-MAINS.

The succeeding item on the *agenda* was a paper, bearing the above title, by Mr. W. Drewry, of Cleethorpes. In the absence of the author through indisposition, the Hon. Secretary read the paper, which, with the discussion thereon, we hope to publish in the next number of the JOURNAL.

THE AUTUMNAL MEETING.

A conversation then took place respecting the town in which the September meeting should be held; and ultimately it was decided, on the proposition of the HON. SECRETARY, seconded by Mr. W. J. BEST (St. Ives) to visit Yarmouth.

This concluded the business of the meeting; but before separating the members passed a unanimous vote of thanks to the Directors of the Peterborough Gas Company for the use of the Board-room.

INSPECTION OF THE GAS-WORKS.

Some of the members and visitors next made a tour round the gas-works, accompanied by the President, who was complimented on the order and neatness which prevails throughout the place. There is no water communication with the works; and they are some distance from the railway station. This, of course, is found to be a great disadvantage; but a partially counterbalancing advantage lies in the fact that those who projected the works were able to secure, in this situation, a large amount of land, which gives the Company plenty of room for carrying on their operations and for extensions when the business further developes. The retort-house is a commodious building, with thirteen settings (seven single retorts to each) in working order. Besides these, a similar setting was being dismantled last Wednesday; two new ones simply required mouthpieces affixed to the retorts; and four recently-erected arches were standing in readiness for equipment when they are needed. Adjoining the retort-house, the President has a roomy coal-store; and he was able, in the early part of last week, to look upon the then pending coal miners' strike with something like equanimity, as he had taken the precaution since Christmas to lay in a good stock of coal, and now has sufficient on hand to meet his requirements for at least two months. The engines and exhausters, tower scrubber, and purifiers were examined by the visitors. As to storeage accommodation, Mr. Barton is very fortunate; having four two-lift holders of good size. The valves by which these are controlled are all placed along one side of a room in close proximity, with a window facing the holders. This is a convenient arrangement, as at a glance the Engineer, or person in charge of the works, can tell the holder from which gas is being distributed, and see its condition. In the same room are situated the station-meter, the governor, and the pressure-gauges. The President's visitors critically examined a simple open saturator system (in which a Coffey still is employed) for manufacturing sulphate of ammonia which he has in operation, and from which he obtains some very excellent results. Last year he carbonized 6800 tons of coal; and the make of sulphate was 86 tons. His fuel account is rather high; but, when an opportunity arises, he intends adding a superheater to the plant, and this, he believes, will reduce the item for fuel. Mr. Barton has a very ingenious plan for cooling his waste liquor. The waste is run into a tank situated underground outside the building. Above the tank he has erected two short shafts, and (according to the quarter in which the wind lies) one forms a down-cast and the other an up-cast. By this means, the liquor is cooled prior to being run into the sewers; and thus all nuisance is avoided.

VISIT TO THE CATHEDRAL.

Some of the members next paid a visit to the cathedral. The famous architectural beauties of the building were greatly admired; and the various relics shown were curiously examined.

THE DINNER.

Early in the evening, the members, with some of their friends, dined together at the Vine Hotel. A number of toasts followed the repast; and a very enjoyable time was spent.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

The Twentieth Annual Meeting.

This Meeting was held at Boston (Mass.) on the 19th and 20th ult., under the Presidency of Mr. ROBERT B. TABER, of New Bedford (Mass.). There was a large attendance; and the preliminary business included the election of 11 members and 6 associates.

The PRESIDENT delivered an Inaugural Address, in the course of which he said that a judge had defined a gas company as a quasi-public corporation existing for the purpose of gain. Accepting that decision, he presumed the object of all present was to follow out ideas, plans, and investigations, that would ultimately bring increased revenue to their employers, and increased light at lower rates to the public. He dwelt somewhat strongly on this theory, because he was afraid that the ancient definition of their duty as gas engineers might require a creed-changing committee, to make it conform to the modified status of the business of furnishing that substitute for daylight which should be found to be best in respect to convenience, adaptability, and price. An Association of Gas Engineers was concerned only with the chemistry and engineering of illuminating gas; but he thought the Association must go beyond scientific problems or theoretical speculations as to the manufacture of illuminating gas. He did not especially allude to anxiety arising from the competition of electricity or water gas, but to the demand on the part of the public for something beyond or in addition to coal gas and which was partly met by electricity. The Massachusetts Gas Commission had been useful in putting the facts relating to the actual cost of coal gas before the public mind; but the gentlemen present that day were interested in something more than this. They were not gathered as illuminating gas engineers, or fuel gas engineers, or electric engineers, but as all of these; and they were not interested in the method and economy of manufacture only, but also in the method and economy of sale. But of the 126 gas companies doing business in New England, probably 25 made and sold water gas, 36 electricity, and nearly all were engaged in the sale and rental of stoves, fittings, and gasaliers. It might be asked, Was this expansion to gas-stoves, fittings, and electricity, from the simple business of making gas, necessary? And was it profitable? He replied that it was only an answer to the call on the part of the public to which he had referred. It was necessary in order for them to retain the good will of the public. In Paris the Gas Company had even illustrated the advantage of gas for ventilation; and this was an example well worth following. Like a shopkeeper they must divide their wares, so as to sell to the best advantage. Care must be taken to make what the people want, as they want it, and to learn how to sell it to the best advantage. Some did not agree that an electric department was a proper addition to a gas company; but even these must admit that the competition of arc and incandescent lamps was increasing, and developing in places

hitherto supposed to be impregnable. He directed attention to the necessity of the Association, as a body, maintaining greater unity in its attitude toward competition and general municipal legislation. They should, without jealousy of interest, freely compare notes, and maintain a solid front against opposition. The Association had a duty to itself in watching the course of legislation, and furnishing reliable information on matters relating to gas interests. The Massachusetts legislature had now before it Bills for the repeal of the 10 per cent. carbonic oxide law; for the repeal of the office of Gas Commissioners; for the regulation of the purchase of gas and electric works by municipal authorities, &c. The disestablishment of the Gas Commissioners would be an injury alike to consumers and companies; and he thought some expression of the kind was due to them from the Association. Indeed, it would be well to appoint a Committee to have care of this subject in the various States represented. The past year had been one of good dividends and fair prices. No one had reached the dollar limit; and no one made fuel gas. The only improvements of any importance had been the substitution of Lima oil for cannel, and home-made iron sponge for lime. The two great movements of the year had been in the departments of water gas and electricity. Fuel gas was resolved into a question of appliances. Much capital had been invested in water-gas plants, mainly as an auxiliary in coal-gas works. The agitation of workmen in England, the cheapness of Lima oil, and the necessity for increased holder accommodation had helped to bring this about. With regard to his own attitude to the electric light department, he explained that in 1886-7 his Company was in opposition to two electric companies—one arc and the other incandescent—and barely held its own. Every exertion in the way of pushing stoves, improved burners and fittings, and also reductions of price, failed to alter this. He bought these two undertakings out; and his Company now sold 42 million cubic feet of gas per annum, and supplied 13,000 incandescent and 550 arc lights—and that in a town of 13,000 inhabitants. He mentioned this to show that such questions as "Could not all this have been done by gas?" and "Would not the same capital have paid better?" must resolve themselves into a matter of demand and supply. It was sufficient to justify the existence of his electric department. In this, the average cost of capital was £50 per horse power, and the repairs and depreciation were less than 5 per cent. No electric lamp was fixed that was not an actual or possible menace of a gas-jet; and therefore it was best that the opposition should be in one's own hands. In the race for future development, he thought that electricity and gas were equally matched. He repeated that it was the duty of the Association not to confine itself to gas, but to get acquainted with every known system of supplying light.

Dr. Amory, of Brookline (Mass.), read a paper on the "Municipal Control of Gas and Electric Lighting." He said that the Gas Commission had pointed out in their official report, that competition between rival companies invariably resulted in consolidation under larger capital investment, and so required unnecessarily large dividends, which the public should not be called upon to pay. At present there was a desire to save the payment of profit to private capital invested in gas undertakings, by means of municipal ownership and management of new plants built upon more modern lines. His present purpose was to show the fallacy of this popular outcry, so far as its applicability to public lighting was concerned. It would lead to duplication of capital just as in the case of a competing company. Then there was the fact that a man or a company that can make the largest sales of daily commodities, can afford to do with a smaller margin of profit than his competitors who made smaller sales. The city that lit its own streets from a municipal works, would be in the position of the small salesman; and the company that had the supply of the shops and houses would represent the large one. Their mains would also be equal to the supply of the public lights; and they would be able to supply them at a less cost than the corporation could do. The expense of distribution would be great in the latter case. The cost of the necessary mains for the street lighting alone in Brookline would be about £15,000; and the annual consumption of gas was about 12 million cubic feet. The cost of a fair interest on distributing plant would therefore be about 2s. per 1000 cubic feet of gas. He then showed by the aid of the published accounts of a small gas company making 12 million feet per annum, that the corporation could not make and supply this quantity of gas to the street lamps under about 10s. or 11s. per 1000 cubic feet. Against this price, the gas company would do wisely to afford every possible inducement in the matter of price, in the way of securing a liberal lighting of the streets. He did not intend to discuss the plan of a town entering upon the supply of gas to private consumers, considering the objections to it to be as obvious as those against keeping a public grocery or any other sort of shop. Several other objections might be mentioned; and a most important one was the fact that town councillors had not the responsibility in the matter of laying out fresh capital—that devolved upon directors of companies or private individuals. They had a free command of money in being able to borrow at low rates, and therefore were much more easy victims for those who had patent processes for the manufacture of gas or electric apparatus to sell. This was exemplified by the large debts already incurred by New England towns, for various public purposes. In reference to the advisability of a town establishing its own electric plant, he referred to the Gas Commissioners report for 1888, which showed that about £1,000,000 was the capital invested in electric light companies in their State. Dr. Amory showed that, according to the returns, the profit earned was only about 2 per cent. on this capital, or excluding the two electric companies in Boston, it was less than 1 per cent. He thought these considerations showed that a municipal plant, either gas or electric, for furnishing only public lighting, would have no chance of competing with a private corporation that undertook the supply of public and private lighting. At Brooklyn there were 36 miles of street arc lighting, and 129 arc lamps. The cost was about 1s. 9d. per lamp per night; and if there were 200 lamps the cost would be about 1s. 4½d. per lamp. So far as the present meeting was concerned, it was his object to prove that if they met the local authorities fairly and liberally, it could easily be shown that the authorities could not do better, or even so well, by supplying themselves.

Discussion having been invited, Mr. Greenough thought that Dr. Amory touched too lightly on the probabilities of cities and towns going in for private as well as public lighting. He did not believe that in Boston, for example, they would ever touch the gas business unless they went in for the private lighting as well, and so secured the profits made by the gas companies. The Gas Commissioners had done good services in showing the real profits made by gas companies, as very absurd notions prevailed on the subject, even in the minds of town councillors. There were cases where municipal gas-works were well managed; but as a rule the result was anything but favourable to municipal control. The statements that had been circulated as to the number and the working of municipal gas-works in Europe would not bear the test of examination; and in many cases great dissatisfaction had arisen because the profits from the gas undertaking had been applied to various public purposes, thus benefiting the taxpayers (and especially non-resident ones) at the expense of the consumer. Referring to the position of the labour question, he thought the effect of the cities buying up the gas-works, would be such a large increase in the wages paid as to increase the price of gas and put it in a very disadvantageous position as regards electricity. Gas must be sold cheaply if it was to compete with electricity and petroleum. The putting of gas-works under municipal control would also stifle invention by removing the necessity for it. Practically all the steps forward that had been made in the gas industry during the last ten years, were the results of private enterprise, seeking to make cheaper gas. In England, the companies made better and cheaper gas than the corporations; and he believed that as a rule the former were willing to pay better salaries than the latter. Mr. Harbison had no faith in the municipal management of lighting stations.

Dr. Amory, in replying, gave some particulars as to the municipal electric lighting at Chicago. From figures obtained on the spot, from the officials, he found that the cost was over 3s. per lamp per night. He also went fully into details of a new station just built, and showed that it would not be much cheaper with the aid of the improvements. At Pittsburgh, an electric light company had been established, and appeared to be successfully making its way against petroleum, natural gas at 5d., and coal gas at 4s. 2d. per 1000 cubic feet. They started three years ago, and until last year had only a few arc lights and 3000 incandescent. Now they had 400 arc, and 14,000 incandescent lights. They had not paid a dividend yet; but he saw no reason why they should not do so next year. Their capital was £90,000, which was all spent, and they had 270 miles of wire, none underground, and the circuit extended 8 miles from the station. Their staff comprised a head engineer, 3 engineers, 2 stokers, 2 boys, 15 linemen, 7 ground men, and a foreman. They had 1800-horse power engine capacity, and 1360-horse power boiler capacity at 80 lbs. pressure. The charge was 0·3d. per hour for each 16-candle light measured by meter, and 12s. 6d. per annum for meter rent. They used natural gas for fuel, and their plant was on the alternating system, capable of supplying 15,000 lamps.

(To be continued.)

Electric Lighting in China.—In the "Electric Lighting Memoranda" in the Journal for the 4th inst., reference was made to a report then in circulation that the Chinese Government had been inquiring into the various methods of electric lighting, and had sent two Commissioners to the United States to make investigations with the view of this system of illumination being introduced into the Celestial Empire. According to the *Financial News*, the idea is about to be carried out; Canton being the city to lead the way. It is stated that a Chinese merchant of San Francisco has floated a Company, and brought all the necessary plant to that great southern city to complete the work, in which he is to receive every encouragement and protection. The new Viceroy—Li Han Chang—has issued a proclamation, in which he demands from all, high and low, under his administration that no impediment shall be placed in the way of the Company's constructions, which will be carried out in such a manner as not to interfere with private rights or public convenience. The Viceroy also observes that, besides the excellence of the illumination given, there is another great advantage attached to the electric light—viz., immunity from accidental fires.

REGISTER OF PATENTS.

Manufacturing Heating and Illuminating Gas.—Steenbergh, B. van, of Goshen, N.Y., U.S.A. No. 10,829; July 4, 1889. [8d.]

This invention, relating to the manufacture of heating or illuminating gas, by the decomposition of steam and hydrocarbon oil, consists in bringing the hydrocarbon and superheated steam into contact alternately with coal and lime; the latter acting as a purifier, and absorbing the carbonic oxide, and thus purifying the carburetted hydrogen produced by this improved method or process. Another important feature of the invention is the provision made for utilizing the waste heat in the decomposing furnace for superheating the steam. The patentee claims that he is able "to manufacture gas for heating or illuminating purposes from very heavy hydrocarbon oils, of a specific gravity of say ·95—an operation which cannot be successfully performed by the methods or processes heretofore known."

Fig. 1.

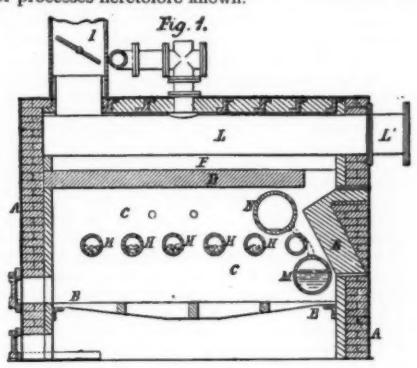


Fig. 2.

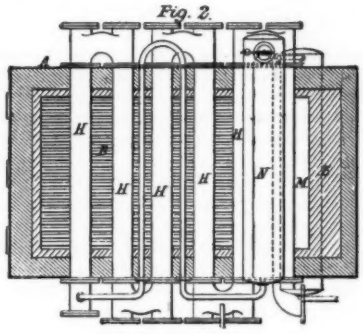


Fig. 3.

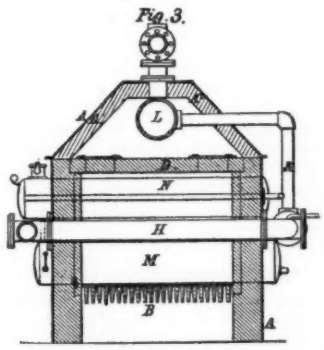


Fig. 1 is a vertical longitudinal section of the apparatus. Fig. 2 is a horizontal section. Fig. 3 is a transverse section.

The retort furnace A has its walls built up of ordinary brick, lined internally with fire-clay tiles or slabs, and covered externally with a jacket of plate iron, cast or rolled. The sides of the furnace are preferably made in sections, bolted together when the furnace is set up. The grate B, supported at its ends upon ledges or lugs, separates the ash-pit from the fuel and retort chamber C. In the front wall are doors opening into the fuel chamber and the ash-pit. A blast-pipe is inserted into the ash-pit for the purpose of increasing the draught; and thus augmenting the heat in the furnace. A partition of fire-clay tiles D separates the chamber C from the upper chamber F; and is provided at the rear end of the furnace with two openings to be partially or entirely closed by dampers, the handles of which should pass out through the wall of the furnace. In the rear wall is built a deflecting bridge E projecting into the chamber C above the retorts, for causing reverberation of the flame and heated products over the tops of the retorts, and thereby ensuring their better heating. The crown of the furnace is constructed of inclined fire-clay slabs or tiles A¹ and horizontal central tiles A. The inclined tiles are for the purpose of throwing the hot products of combustion against the sides of the retort; and thus uniformly heating it, and economizing the heat in the most advantageous manner. A chimney I, with a regulating damper, for the escape of products of combustion, rises from the top of the furnace near the front end; so that the hot products are compelled to pass through the whole length of the chamber F, and impart their heat to the fixing retort. The decomposing retorts or conduits H are composed of numerous straight sections, extending transversely across and through the walls of the chamber C. The straight sections and return bends are provided with flanges tightly secured together by bolts or screws, so that the bends may be readily removed for charging the retorts with coal or other material, and for cleaning them out when necessary. At the end of the series of retorts near the rear of the furnace, a pipe K connects them with a fixing retort L in the chamber F. This retort is provided with the usual mouthpiece L¹, having a tight-fitting lid; and a pipe is provided for conducting gas to the hydraulic seal or washbox, or to any place of storeage for use. An oil-supply pipe is connected with one of the retorts H; and a steam-supply pipe is connected with the steam space N of a generator or boiler M N, and with a pipe extending through the upper part of the fuel chamber C a sufficient number of times to ensure the superheating of the steam. It is also connected with retorts at one end, or at the bend between the third and fourth retorts, or at any other convenient point. By passing the pipe through the fuel chamber, the waste heat is utilized for superheating the steam.

In making illuminating gas, the retorts H are filled alternately with coal and lime; and the furnace is heated to a suitable temperature. The retorts are charged with anthracite coal or other material affording a large heating surface, so as to partially fill them and leave a passageway for the gas. The retorts are preferably made small; and a considerable number are provided, so that they may be quickly and thoroughly heated. Heavy hydrocarbon oil is then run in, as well as steam. The steam, after being superheated by the heat in the upper part of the fuel chamber, is admitted into the retorts, and is decomposed by contact with the incandescent carbon, forming hydrogen and carbonic oxide; the latter being absorbed by the lime, so that pure hydrogen is produced. The hydrocarbon oil is converted by the heat into carburetted hydrogen gas, which serves to enrich the hydrogen, and thus form an illuminating gas. The gases from the decomposed steam, and that from the oil, are conducted into the fixing retort L, where they are converted into a fixed illuminating gas of high power. Should it be found that the heat is too high for safely and economically admitting hydrocarbon oil into the retorts H, it may be admitted into the ascending pipe K, and there be vaporized by the hot gas passing to the retort L; or the oil may be admitted into the retort L near the inlet for the gas from the retorts H.

Dry Gas-Meters.—Wynne, J. T., and Morrison, A. C., of Melbourne. No. 598; Jan. 13, 1890. [8d.]

The patentees' object in this invention is to simplify the construction of dry gas-meters, and so reduce their first cost, lessen wear and tear, and facilitate repairs.

Fig. 1.

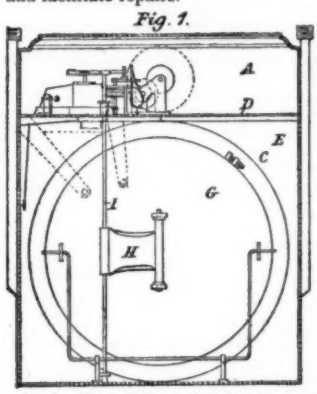
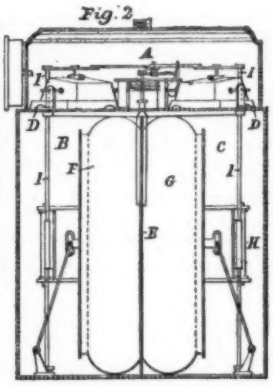


Fig. 2.



In the illustration—showing front and side elevations of the meter—A B and C represent three compartments or chambers into which the meter is divided; the horizontal plate D serving to divide the upper chamber A from the lower ones B and C, while the vertical partition E divides the two lower compartments B and C from each other. Within each of these latter is arranged (as ordinarily) an expanding and contracting chamber or diaphragm F and G, adapted to operate slide-valves through the medium of flags H, a flag-wire I, and the following mechanism:—To the upper end of each of the flag-wires is secured a crank arm having a slot through which passes a set-screw, which projects downwardly to between a pair of transversely-arranged guides provided on the upper surface of each of the slide-valves. The outer ends of these crank arms are connected each by a rod or link to another crank or radius arm secured upon the upper end of a vertical spindle, upon which is secured a worm. This latter is provided for the purpose of communicating motion through a worm wheel and spindle to the usual index dial of the meter.

The slide-valve employed connects two ports, one arranged in the centre of the valves (as ordinarily); while the other is arranged around three sides of the first one. The gratings upon which these valves slide are provided each with four ports, two of which are in communication with the inlet passage; while the other two of the first set are in communication with the outlet. Of the other four, one is in communication, through an approximately triangular passage and downwardly projecting passage, with the chamber C. The second is in communication with the expanding and contracting chamber G. The third is in communication with the expanding and contracting chamber F; and the fourth is in communication with the chamber B.

The operation of the meter is as follows:—Assuming the slide-valves to be at the outer extremity of their stroke, the expanding and contracting chamber G full of gas, and the chamber F empty, then the progress of the gas through the meter will be as follows: Passing along the inlet passage, it flows into the triangular passage, and from thence into the chamber F. At the same time the gas will pass through the ports into the triangular passage above mentioned, and thence into the chamber C. During all this time the chamber B is in communication with the exit passage; while the chamber G is in communication with the exit. When the slide-valves are at the inner end

their stroke, the expanding and contracting chamber F and the chamber C will be in communication with the exit, while the chambers G and B will be in communication with the inlet; the flow of gas being as follows: From the inlet it passes through the ports and along the passages into the chamber B, and through other ports and passages into the chamber G; while the gas which is contained in the chamber F will pass to the exit, and the gas from the chamber C through the passages and ports also to the exit.

Softening and Filtering Water under Pressure.—The Water Softening Company, Limited, of Victoria Street; Easton, E., of Delahaye Street, Westminster; and Carrod, H., of South Croydon. No. 12,973; Aug. 16, 1889. [8d.]

According to this invention, a closed vessel is provided of a conical form, with its smaller end downwards, in which is contained the lime or other re-agent to be used for treating the water. It is provided at its lower part with an inlet for liquid; and at its upper part with an outlet for the mixture of the re-agent. Below this re-agent vessel is another vessel in which the liquid to be treated is received from the main or other source of supply of water under pressure. This supply-pipe has a branch by which liquid is led into the re-agent vessel, to mix with the lime or other re-agent. The outlet-pipe from the re-agent vessel leads into the pipe which supplies the second vessel; so that the re-agent and water to be treated are supplied together to this second vessel, and discharged into it preferably at the lower part, passing off from it by an outlet at the upper part. It flows thence into the lower part of a third vessel, at the upper part of which is a filter of any suitable material supported between perforated plates, asbestos cloth, or other appropriate material. This third vessel has an outlet above **the filter.**

When the apparatus is in use, the liquid under pressure enters the re-agent vessel, and mixing with the re-agent therein carries it down, and it passes with the liquid to be treated into the second vessel, where some of the matter therein deposits. The liquid, as it rises in the vessel, passes off by the outlet and the pipe in connection therewith, and enters the lower part of the third vessel, where further impurities settle out. The liquid passes up through the filter in this vessel; and as it rises above the filter, it flows away by the outlet, and is led to any desired place of storeage or utilization. Means are provided for clearing out the sludge of deposited matter from the several vessels.

Gas-Engines and Igniters.—Crist, W. E., of Brooklyn, and Covert, H. C., of New York. No. 20,249; Dec. 17, 1889. [8d.]

This invention pertains to that class of motors which are driven by the explosion of a gaseous compound produced by means of a suitable igniting device. It consists in combining with the engine, a working-piston vibrating in a sectoral working-chamber, a compressing-piston vibrating in a separate sectoral compression-chamber, and operating to compress and carry an explosive gaseous charge towards the working-piston as it advances, a spring-controlled valve governing a port or passage connecting the supply and working-chambers and opening towards the latter, an igniting-device communicating with the working-chamber and operating to fire the charge compressed therein at the end of the stroke of the piston towards the charge, and means for discharging the burnt gases.

APPLICATIONS FOR LETTERS PATENT.

3767.—Wenzel, A., "Improvements in incandescent gas-lamps." March 10.

3774.—Abel, C. D., "Improvements in gas motor engines." A communication from the Gas Motoren Fabrik Deutz. March 10.

3908.—M'Lennan, Mary E., "Improved governing apparatus for regulating the pressure and supply of gas and the like." March 12.

3921.—Daelstaen, M., "Improvements in gas-engines." March 12.

3947.—Clegg, J., "Improvements in the manufacture of light emitters or illuminants for electric or other lamps." March 13.

4003.—Eckersley, W., "Governor for gas, or oil, or any other engine." March 14.

4027.—Walker, W. T., "Improvements in gas storeage apparatus." March 14.

4041.—Jaques, W. E., and Johnston, J., "Improvements in gas-burners for cooking and heating purposes." March 15.

4074.—Griffin, S., "Improvements in apparatus for regulating or governing the supply of gas to gas motor engines." March 15.

New Joint-Stock Companies.—The South Barracas (Buenos Ayres) Gas and Coke Company, Limited (the undertaking referred to in the Journal for the 4th inst.) has been registered, with a capital of £50,000, in £10 shares, to manufacture and supply gas for public and private purposes at Buenos Ayres, or in the suburbs and adjoining districts. The Durand Electric-Petroleum and Gas-Engine and Manufacturing Company, Limited, is the title of a Company started with a capital of £100,000 in £5 shares, to acquire the business now carried on by M. Durand in Paris, and all the patents, inventions, and contracts connected therewith.

The Sutton, Southcoates, and Drypool Gas Company and Electric Lighting.—A Wharncliffe meeting of the Sutton, Southcoates, and Drypool Gas Company was held last Wednesday, to pass a resolution approving of the Bill now before Parliament, authorizing them to supply electricity for lighting purposes within the borough. In moving the resolution, the Chairman (Mr. J. J. Runton) stated that the Board, after making extensive inquiries, and being advised by eminent authorities both in gas and electric lighting, had come to the determination to recommend the proprietors to apply for the necessary powers for enabling the Company to undertake, by agreement with the Corporation, the supply of electric light within the area of the Company's district, in contemplation of the Corporation delegating the electric lighting powers for which they were applying by Provisional Order in the present session. Mr. R. G. Jalland seconded the resolution, which was carried unanimously.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Proposal to Abolish Gasholder Guide-Framing.

Sir,—In reading your article, in the Journal for the 18th inst., entitled the "Influence of an Idea," I have been somewhat struck with certain observations, and far more with apparent assumptions, of curious moment contained therein. I am not a gas manager, but I take an engineer's interest in all new modes of construction and engineering progress of all kinds; and I have had the opportunity and pleasure of examining the example of the new departure in gasholder construction at Northwich.

I find on p. 486 of the last number of the Journal, referring to a paper by Mr. Webber, these words: "The gist of the article lay in a suggestion that a gasholder might be maintained in a proper working position by means of the bottom curb." I read the paper of Mr. Webber's, together with the correspondence which followed thereon; but I did not see that Mr. Webber ever proposed any means of guiding a holder from the bottom curb *alone*. I understood his proposal to be the treating of a gasholder as a "stumpy post in a socket"—a proposal which both Mr. Gadd and "Theory and Practice," in the subsequent controversy, showed to be completely untenable and impracticable.

I have been under the impression, until I read your article of the 18th inst., that our townsman Mr. Gadd was not only "the first in the field with a patented device," but the first to demonstrate the possibility, or to suggest the practicability, of guiding a holder from the bottom curb *alone*, and utterly abolishing the guide-framing external to the tank. If I am wrong in this supposition, and as this matter will doubtless become historical in the art of gasholder construction, I shall be glad to know when or where Mr. Webber proposed to guide a holder from the bottom curb *alone* (or for that matter anybody else), prior to our Manchester engineer and inventor.

Feeling sure you can have no desire to manipulate history, I expect you will support me in giving ungrudging

"Honour where Honour is Due."

Manchester, March 22, 1890.

[Writers who indulge in hints about the manipulation of history, should be careful in their own quotations, and refrain from publishing "impressions" unless their opinions can be supported by irrefragable evidence. The passage referred to in our correspondent's letter applied to an *article* which appeared in the Journal for March 29, 1887, while he speaks of Mr. Webber's *paper*, which did not appear till three months later. While our correspondent was looking up the latter, it is odd that he should have passed over the remark in the first paragraph, which states that "the purpose of this paper is to show that the ordinary lofty guide-framing of gasholders may be safely dispensed with, and its place supplied by a system of *guiding from the base*." The italics are in the original. It is true that Mr. Webber proposed to duplicate bottom curb and rollers; whereas Mr. Gadd later on patented a device requiring only the rollers to be doubled. But it appears to rest with Mr. Gadd, if he desires to claim priority for the idea of supporting a gasholder from the base, to produce something published by him anterior to the appearance in print of Mr. Webber's suggestion. Mr. Gadd has his patent, for which we have always given him every credit; but he has not yet claimed as his own everything said or done in the same direction before and since his application. He is quite able to take care of his own credit in the matter; and if we have inadvertently injured him, he will doubtless convince us of the justice of making him the *amende honorable* which we should in that case most willingly proffer.—Ed. J.G.L.]

The Warrington Corporation and the Water-Works.

Sir,—My attention has been called to a somewhat remarkable paragraph which appeared in your issue of the 18th inst., with reference to the proposed purchase by the Warrington Corporation of the undertaking of the Warrington Water-Works Company.

The point which more immediately concerns me is the allegation, which you say is made, that a sum amounting to nearly £3000 has been entirely omitted from the calculations; and as I am responsible for the calculations to which you probably refer, I shall be glad if you will give me the opportunity of saying that there is absolutely no foundation for the statement, and that the paragraph in question gives, so far as I know, the first intimation of any such statement. I forward you herewith a copy of a report upon the financial aspect of the matter which I made to the General Purposes Committee of the Corporation, and a copy of the last statement of accounts of the Water Company, and shall be much indebted to the writer of the paragraph if he will point out the alleged discrepancy.

I cannot allow this opportunity to pass without some further comment. The statement that the Company have agreed to accept, and the Corporation to pay, a sum of £270,000 is not true. The Company could not, under any circumstances, agree to sell without submitting the terms to the stock and share holders. The question has not been considered by the latter; and there is not even a conditional acceptance of the terms by the Directors, though there are good reasons for believing that they would be agreed to. All that the Corporation have done is to make an offer of certain terms, which are to become binding on their part *if* the ratepayers and Parliament approve, and *if* satisfactory reports be made by competent persons to be appointed to inspect the works and accounts.

The remark that "it is clear that the effect of the purchase will be to add a sum which may be 8d., and is certain to be at least 3½d., in the pound to the existing local rates," is as fallacious as the statements already referred to. The resignation of the Town Clerk, whose ability

no one will call in question, is not likely, as regards this matter, to prove the great misfortune you appear to anticipate. The reverse, rather, is the case; inasmuch as, through his instrumentality, an offer has been made to the Corporation by the petitioners against the Bill whom he represents, to pay the Corporation a sum equivalent to the probable increase in the rates; and I may add that the Corporation have in their newly-appointed Town Clerk a gentleman who is quite competent to deal with the Bill, and who has been familiar with it from the first.

This is intended as a refutation of some only of the assertions made; and I do not propose to occupy your valuable space by a reference to the absurd insinuations of mystery, and goodness knows what beside, with which the writer has sought to give force to his ill-conceived effusion. Very little reflection upon the true position of affairs will probably lead you to the conclusion that we are not in the habit of acting, even in Warrington, quite so idiotically as some people would lead you to imagine.

Warrington, March 21, 1890. T. L. TUNSTALL.

[Mr. Tunstall might himself have answered every one of his questions by referring to the reports in the local papers of the various Council and other meetings on the subject of the Bill, or to the careful summary of these proceedings which appeared in the JOURNAL last week (p. 567). Had he read either, he would have seen that the article to which he directs attention does not "give the first intimation" of the statement respecting the sum of £3000 alleged to be omitted from the calculations. The original author of it was Mr. Monks, a member of the Corporation, who at the Council meeting on the 4th inst. advanced it as a reason for referring the whole matter back to the General Purposes Committee for reconsideration. The sum which Mr. Monks is reported to have stated that the "Sub-Committee had said nothing about" is £2933. This exactly represents the amount appearing in the last balance-sheet of the Company as lying at the bankers to the credit of capital account; and we presume Mr. Monks had some reason for his allegation that the Company were likely to take a different view from that of the Corporation with regard to its disposal. As to the so-called fallacy of the statement that the purchase will necessitate an advance in the rates, we find that Mr. Tunstall himself reports that there is a "risk" of "a charge upon the rates, of 3¼d. in the pound;" while other authorities (including Mr. Alderman Harrison, who is in favour of the purchase) have put it as high as 8d. On the other question, as to the resignation of the Town Clerk, it is only necessary to say that, as appears from the report of the last Council meeting, some members of the Corporation differ as widely from Mr. Tunstall upon this point as upon the matters already referred to. Our observations cast no reflection upon either the late or the new Town Clerk. There is, however, a very excellent maxim about the inadvisability of "swopping horses when crossing a stream," which is not without application to this case.—ED. J.G.L.]

The London County Council and the Disposal of Sewage.

SIR,—In a paragraph, under the heading of "London Sewage," in your issue of yesterday, it is stated that I have given instructions to a certain firm to prepare a scheme for dealing therewith. How such a statement came to be inserted in the JOURNAL I cannot understand, as there is no foundation for it whatever. Neither have I any knowledge of the firm in question. The only scheme which I have anything to do with is that now in operation at the Barking Creek precipitation works, under the direction of the Council.

W. J. DIBDIN, F.I.C., F.C.S.,
Chemist to the London County Council.

Spring Gardens, S.W., March 19, 1890.

The Storeage of Naphtha in Water-Gas Works.

SIR,—The "Note" on the above subject in the last issue of the JOURNAL, induces me to point out that the usual difficulty and danger in the transport and storeage of naphtha or other inflammable oils in or about a gas-works—and, in fact, anywhere, or for any purpose or use—has already been entirely overcome, and all the usual risks of fire and explosion rendered impossible. This is a strong expression; but I think it will be justified before I conclude.

By a recent invention, or rather an ingenious application of well-known facts, the safe storeage of the most inflammable or vapour-giving oils is assured, from the smallest domestic can of benzoline or kerosene, to tanks of many thousands of gallons capacity; while its general adoption for such storeage would save the greater portion of the loss of property and the many lives now annually destroyed by fires and explosions arising from the use of petroleum and its derivatives—losses now serious enough, though considered unavoidably due to the extensive and continually extending use of these oils.

The recent article and correspondence in the JOURNAL on "Water Gas for British Gas-Works," tend to foreshadow the introduction of crude petroleum or some equivalent into gas-works generally—an event to be expected in the near future, if not already actually in use in a select few in our own country, the pioneers of a more extended employment. It would be easy to show at the present time, and at actual prices, that crude oil can economically replace cannel coal so commonly used for enriching gas; while it may safely be foretold that a demand once created would bring in an unlimited supply at less than half the present prices. This, however, is not, for the moment, the point in question, but how to safely store the oils in large or small quantity, whether for use in gas-works or for any other purpose?

The plan before alluded to is called "Buckwell's System;" and it is the invention of an English engineer long resident abroad, who has devoted considerable attention to the subject. The primary object of the plan is to secure perfect safety from fire or explosion when dealing with dangerous oils, by rendering it impossible for any vapour to form, accumulate, or expand into any void or air space, by not permitting any such voids or spaces in the storeage tanks, whether full of oil (in the ordinary sense), half full, or empty. To accomplish this, there must be no pumping, agitation, or commotion of the oil (tending always to produce vapour); and still the oil must be raised to any desired height, or delivered at any distance, at any desired pressure, from the tank, and which, if need be, may be underground.

All this may sound very like a paradox; but it is simply managed by the use of water and water pressure. Water, by its superior specific gravity, and by its property of being non-mixable with oils, is the indispensable agent, easily dealt with and absolutely safe, whether it is pumped by hand or power, delivered from a main, taken from a high source, or provided in any other manner. Its application is so arranged and controlled as to support the oil above it—flowing in from below, and compensating for any withdrawal of oil from the tank or reservoir; thus leaving no air spaces in them, or any point of contact of the oil with air, giving any pressure, or delivering the oil to any distance or height, through pipes of any capacity, which pipes can by simple means be jointed perfectly oil-tight.

It follows, therefore, that oil for use in gas-works need not be stored on, or even near, the premises, if there is not room or convenience for it, but would be almost as handy and convenient if miles away, and at a much lower level; the mere opening of a valve on the works giving any supply desired direct to the retorts or carburetting apparatus, and so arranged that the oil need never be exposed to air at all, even at its outflow. Consequently, it would be impossible to fire it at any point. The size of a tank or reservoir due to the capacity of a works for the production of a million cubic feet of water gas per diem, to give a sufficient store for a fortnight, or (say) even 50,000 gallons, need not be considered very serious, seeing the immense steel tanks of hundreds of thousands of gallons capacity at present in actual use for the storeage of petroleum in the ordinary way. In small works, any sound tank or vessel could be utilized as the reservoir (buried underground if necessary), and would be as free from risk as, and much less liable to any accident than, the gasholders themselves.

It would, I fear, occupy too much of your space to enter into all the details of this system of storeage and transport; but I would gladly give them if considered of sufficient interest to your readers.

Woodbridge, March 19, 1890. L. A. SCOTT, Mem. Soc. Eng.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

During the past week the following progress was make:—

Bill read the first time: Smoke Nuisance Abatement (Metropolis Bill.

Bill committed: Falmouth Gas Bill.

Bills reported: Birkenhead Corporation Bill; Bury Corporation (Railway) Bill; Dewsbury and Heckmondwike Water Bill; Leicester Corporation Water Bill; Mid-Sussex Water Bill; Morley Corporation Water Bill.

Bills read the third time; Baildon Local Board Bill; Birkenhead Corporation Bill.

Opposition withdrawn: Newcastle and Gateshead Water Bill.

HOUSE OF COMMONS.

During the past week the following progress was made:—

Bills read the first time: Baildon Local Board Bill; Birkenhead Corporation Bill.

Bill read a second time: Airdrie and Coatbridge Water Bill.

Bills reported: Canterbury Gas and Water Bill; Hartlepool Gas and Water Bill.

Bill read the third time, and passed: Clayton, Allerton, and Thornton Gas Bill.

Petition presented: Riparian owners on the River Colne in favour of the Wessenden Reservoir Bill.

Petition withdrawn: Corporation of Gravesend against the Gravesend and Milton Gas Bill.

Inauguration of the Stone Local Board Water-Works.—Last Tuesday week (rather more than two years after the conception of the scheme) the water-works which have been constructed by the Stone Local Board for the supply of the town were formally inaugurated by Lord Harrowby. The event was celebrated by a dinner, at which the Chairman of the Water Committee (Mr. J. Harding) proposed a toast to Lord Harrowby, and presented him with a silver key. In reply, the noble Earl complimented the Engineer (Mr. G. D. Harrison) on the successful completion of the undertaking, and stated that there was a supply of water large enough to provide for a town twice the size of Stone. The water, it was mentioned, was pumped from a depth of 500 feet, and stored in a reservoir, capable of holding 300,000 gallons, situated at a height of 300 feet above the Market Place.

The Deputy Water Engineer of the Liverpool Corporation.—It will be remembered that a short time ago the Water Committee of the Liverpool Corporation recommended the Council to appoint Mr. Duncanson as Deputy Water Engineer at a salary of £500, and relieve him of a certain portion of his duties. His present salary is £650. The Council referred the recommendation back to the Committee, with the request that the duties which it was proposed Mr. Duncanson should fulfil at the reduced salary should be defined. In compliance with the instructions of the Committee, Mr. J. Parry, the Water Engineer, yesterday week submitted his report on the subject. According to this, Mr. Duncanson's duties would include the supervision of the pumping stations and machinery, and occasionally the entire charge of the Water Department during the absence of Mr. Parry. It was resolved that the report be printed and distributed among the members.

MISCELLANEOUS NEWS.

THE SUPPLY OF WATER GAS IN MASSACHUSETTS.

In previous issues of the JOURNAL, reference has been made to the proposals submitted to the Massachusetts Legislature, by the Board of Gas and Electric Light Commissioners of that State, to amend the law under which water gas is supplied, so as to afford better security to the consumers. The Board's action, it may be remembered, was the result of some carefully conducted investigations, in the course of which they endeavoured to ascertain if any advantage would accrue to the consumers and the companies from an extension of the present statutory limit of carbonic oxide allowed to be contained in the gas as distributed. They obtained information from upwards of 100 companies; and the results are given in the last annual report published by the Commissioners. As the supply of water gas is a question occupying the attention of many gas engineers outside the State specially interested in the investigations alluded to, we reproduce, practically in its entirety, the chapter of the report devoted to this matter.

It is clear that the cost of gas, whether coal or water, is not an inflexible figure—the same for all time and places; an advance of 50 c. per ton in coal, or of 1 c. per gallon in oil, making an increase of 10 per cent. in the cost of coal and water gas respectively. In certain large works, where both kinds of gas have been made, the advantage in cost of production has been sometimes with one, sometimes with the other kind of gas. There are more exclusively water-gas works in the anthracite coal region in Pennsylvania, and within easy reach of it, than in any other portion of the country of the same area, because there the price of anthracite coal has been low, and that of gas coal relatively very high. The particular location of a gas-works, and its arrangement, the quality of the materials, and the kind of apparatus used, and the kind of labour and superintendence available, may make even large variations in the cost of either gas. The expenses of distribution, management, taxes, &c., are not likely to vary to a great extent, whether coal or water gas is the product; so that the factor of value in estimating the cost of the two gases is the cost to manufacture, or cost in the holder, as distinguished from cost at the meter.

The principal items of cost in the holder are for materials (coal and oil), labour, and repairs. From the cost of materials in coal gas has to be deducted the very considerable receipts for the sale of coke, tar, and ammoniacal liquor. Under the best conditions in this State, these receipts have reached 50 per cent. of the cost of coal; and in some companies more favourably situated, they have reached a much higher percentage. A ton of good gas coal will yield approximately 10,000 to 11,000 cubic feet of gas. In order to secure the candle power usually supplied in this State, there must be added about 10 per cent. of cannel, or something more than 5 gallons of oil—equivalent to more than half a gallon per 1000 feet. In the production of illuminating water gas, there is commonly used more than 50 lbs. of hard anthracite coal, and from 5 to 6½ gallons of oil for every 1000 cubic feet of gas, although in the very best works, and under very favourable conditions, these quantities may be slightly reduced. These two items nearly make up the cost of water gas in the holder. In coal gas the cost of labour is a most important element. It often nearly equals half the gross cost of materials; and in many companies does not vary much from the net cost of coal. In water gas the cost of labour is small. It has been very difficult for the Board to obtain definite and reliable information as to the cost of repairs in water-gas works. It is not a very considerable item in the case of coal gas, and is probably about half as much in that of water gas.

The following figures show the range of cost in certain companies, each item being calculated independently of the other; and it is believed they fairly indicate the difference of cost in the holder of the the two gases:—

Coal Gas.

	Cents.
Gas coal	40 to 43
Oil or cannel	3 „ 7
Residuals	13 „ 23
Net for materials	20 „ 30
Labour	14 „ 20
Repairs	5 „ 8
Total	50 „ 57

Water Gas.

	Cents.
Coal	11 to 15
Crude oil	13 „ 18
Naphtha	24 „ 33
Materials—	
Crude oil	26 „ 33
Naphtha	38 „ 45
Labour	5 „ 11
Repairs	2 „ 3
Total	46 „ 55

The figures relating to coal gas are taken from the returns of certain companies in this State, as made to the Board. The figures referring to water gas are estimates based upon information procured without the State, and intended to show what the same companies might do, at current rates for materials, if they were making this instead of coal gas. It may be noted that the companies now making water gas in this State have not yet been able to equal the figures given. The relations shown above may be greatly changed at any time. The figures given for naphtha and crude oil are suggestive. A few years ago, when the number of water-gas works was small, the price of naphtha was about the same as that of crude oil to-day. As the demand for naphtha for gas-making purposes increased, the price advanced to a point which nearly neutralized the advantages of its use. Recently a crude oil, from the Ohio fields, difficult to refine, has come upon the market at a low price; and an apparatus specially adapted for it has again reduced the cost of water gas to the low point reached when naphtha was first introduced. There are now signs of an advance in its price. There have been great improvements in water-gas apparatus, and there is much activity in this direction now. It is now claimed that cheap bituminous coal and slack can be made to do the work of expensive anthracite; and, if the expectations of the inventors of this new process are realized, the cost of producing water gas may be greatly lessened.

In companies whose output is below a certain limit, the peculiar conditions under which they make gas cause the cost to vary greatly from the figures given above. In these the cost per 1000 cubic feet for both coal and labour rises rapidly where coal gas is made. There is little or nothing obtainable from residuals, as all, or nearly all, the coke is used to carbonize the coal, and the production of gas per man is greatly reduced, since of necessity the gas maker must be idle much of the time. In a properly constructed water-gas works of very small output, while the cost of coal may be easily doubled by the necessity for frequently cooling and reheating the apparatus, the cost of labour is not materially different from the same item in large works. In a single day one man may make and store water gas sufficient for several days' consumption, during which the works need no attention, and the gas maker can devote himself to the numerous other details of the business. Instances have been observed by the Board, in other States, where small works have been carried on in this manner with apparently good results. For reasons not easy to enumerate, the attempt by small companies in this State to pursue a similar course have not heretofore been successful.

Although in the larger works, except in favoured localities, the commercial advantages of manufacturing exclusively coal or water gas may not be considerable, with the methods and apparatus now most in use, the advantage to company and consumer in the combination of the two gases is now generally recognized by the larger companies; and nearly one-third of all the companies in the country manufacture some water gas. The development of electric light, combined with other causes, has greatly increased the public demand for light. A gas of 15 or 16 candle power is no longer acceptable; and from 18 to 20 candle gas is as low as companies in the larger towns and cities think it wise to distribute. Gas of this quality cannot be produced with ordinary coal alone, but requires the addition of cannel coal or oil; which latter, from its low cost and the facilities for handling, has been most generally adopted. For this use of oil the ordinary appliances of a coal-gas works are but poorly adapted. When oil is used in them, it has shown a decided tendency to pass with the coal gas as a vapour, much of which is subsequently deposited in the mains or fixtures in a liquid condition, or, by causing a hard substance to form at the tip, obstructs the flow of gas, and causes the forked and irregular flame so common where such gas is used; and the gas often manifests an uncontrollable tendency to smoke. To a high candle power secured in this way is often due the blackened spots in the ceilings of dwelling-houses where such gas is used.

A water-gas apparatus affords the means for avoiding these difficulties. In this the heats best adapted to breaking up the oily particles into a fixed gas may readily be attained, and gas of a very high candle power be produced. When coal gas is made at the same works, and the two are mixed in the proper proportions and best manner, the unfortunate results mentioned as due to oil should not occur. The gas is composed of the same constituents, but in different proportions, and reaches the burner with that combination of heating and illuminating elements calculated to give a clear, white flame, free from smoke.

Numerous other reasons suggested by local conditions have induced companies to add to coal-gas works apparatus for making water gas. It enables a company to easily meet a sudden demand for an unusual amount of gas. It can be made ready for gas making at an hour's notice, then allowed to cool when the demand is over, and this course repeated indefinitely without injury; while coal-gas benches once treated in this manner would probably need rebuilding. An unexpected dark day may thus be readily provided for, and also the considerable changes in consumption where street lights are burned by moon schedule, but are unexpectedly called for on stormy nights. In some places the increased consumption has made necessary some increase in the capacity of the works, which has been secured with less expense for extension by the introduction of water-gas apparatus, with a consequent saving in capital account. A brief period of extraordinary consumption in midwinter is sometimes provided for in this way. In many works where both kinds of gas are made, coke produced at the works is substituted for anthracite, furnishing a profitable use for surplus coke, and preventing a reduction of its price.

These are some of the indirect advantages resulting from a manufacture of both kinds of gas in the same works. They are quite independent of whether one gas made alone costs a little more or less than the other. To secure them requires the distribution of a gas containing somewhat more than 10 per cent. of carbonic oxide.

The question of the comparative safety of water and coal gas is a very perplexing and difficult one to solve satisfactorily. One or more members of the Board have personally examined the premises where a large number of deaths have occurred from asphyxiation by inhaling illuminating gas in Brooklyn, New York City, Baltimore, and other cities. A few of these deaths were caused by coal gas; others probably by a mixed gas; but the larger number were due to water gas. Some very valuable suggestions have been obtained from these inquiries, although great difficulty was experienced in securing exact or definite information. It was impossible, for example, in most cases to ascertain the length of time the gas was discharged into the room; and in many instances the size of the burner, and whether partially or wholly open, were only matters of conjecture. Most of the accidents investigated occurred at the cheaper boarding and lodging houses. It was found in one city—and the same facts also applied to the others in a less degree—that a very low price for gas, great activity on the part of competing companies in canvassing for customers, and the very favourable terms that were made for piping buildings and furnishing fixtures, had led to the introduction of gas into the very cheapest lodging and boarding houses that are frequented by the dissolute and ignorant classes. In several instances it was evident that the inhaling of gas alone would not have produced death, but caused it by aggravating diseases existing at the time of the accident. Some of the rooms contained less than 500 cubic feet of space; and the average space

of all the rooms was something like 1100 cubic feet. The largest amount of gas was 75 cubic feet, as nearly as could be ascertained, in a room containing 748 cubic feet of space; but there was an open transom at the time of the accident, and the person lived 12 hours after being discovered. The smallest amount of gas was 18 cubic feet, in a room containing 806 cubic feet of space; and the person was dead when found. The average amount of gas in the rooms was about 38 cubic feet. But, as before intimated, the information in regard to the amount of gas in the rooms where deaths occurred is unsatisfactory. In three instances, where a man and a woman occupied rooms together, the men died and the women recovered.

In addition to these investigations, the Board has obtained, from newspapers and other sources, information in regard to the deaths of 107 persons in this country from inhaling illuminating gas during the year 1889. This is probably not the whole number of deaths from this cause, but is perhaps complete enough to give some facts of interest in considering the question of danger from illuminating gas. There is conclusive evidence that 30 of these persons committed suicide; and there were circumstances attending the deaths of several others that indicated more or less strongly the same cause. But, deducting from the whole number only those suicides about which there can be no doubt, there were 77 deaths caused by accidentally inhaling illuminating gas. These occurred in the following towns and cities:—Yonkers (N.Y.), 1; Baltimore (Md.), 7; Oakland (Cal.), 3; Jersey City, 2; New Brunswick (N.J.), 1; Amesbury (Mass.), 1; Paterson (N.J.), 6; Huntington (Pa.), 1; and Bethlehem (Pa.), 3. In these places only water gas is believed to be manufactured. In New York there were 24 deaths; in Philadelphia, 2; in San Francisco, 7; in Chicago, 5; in Brooklyn, 3; in Washington (D.C.), 2; in Minneapolis, 1; and in Charlestown (Mass.), 1. In these towns and cities a mixed coal and water gas is made, or there are coal and water gas plants in operation. There was one death in Cincinnati; two in Milwaukee; one in Lincoln (Neb.); one in Belleville (Ill.); and one in Portland (Me.). These have only coal-gas plants. The following are the number of deaths for each month:—January, 9; February, 5; March, 6; April, 3; May, 5; June, 7; July, 1; August, 1; September, 5; October, 10; November, 11; December, 12.

Some 46 of the deaths occurred in hotels—generally of the cheaper class—and lodging and boarding houses, where the rooms were usually small and poorly ventilated. In 18 of the accidents the gas was blown out by ignorant persons; and in 46 instances it was found turned on without any satisfactory evidence as to the cause. In eight instances death was caused by gas-stoves, in one by a leaking pipe, and in three by defective keys where the gas is turned on at the burner. Of the persons killed, 25 were females and 52 males. Of the males, 17 were business men, four farmers, two professional men, six labourers, two sailors, two mechanics, one janitor, one railroad man, one teamster, one bar-tender, one waiter, one student, and seven unclassified. Ten of the females were servants. In 20 cases the persons were more or less intoxicated at the time of their deaths. It will be seen that 26 of the deaths occurred in places where only water gas was manufactured, 6 in those having only coal-gas plants, and 46 in towns and cities furnished with a mixed water and coal gas, or where there are plants of each gas. The largest number of deaths was 24, in New York City. In New England, where 14 cities and towns are furnished with water gas and 6 with a mixed water and coal gas, there were three deaths. One of these resulted from inhaling water gas, one from coal gas, and the third was caused by a mixed water and coal gas.

Some of the inferences to be drawn from the above facts are that about 30 per cent. of the deaths from illuminating gas were suicides; that about 20 per cent. were persons more or less intoxicated at the time of the accidents; and that a considerable number were persons unacquainted with the use of gas. A comparatively small number of cases are purely accidents that could not have been avoided.

From the fullest consideration which the Commissioners have been able to give to the Act, chapter 428 (Acts of 1888), they believe that the correct interpretation of the statute does not permit them to issue a revocable licence or one subject to modification, to impose any terms or conditions in the exercise of it, or to qualify in any manner the certificate which the licence must contain, "that in their opinion the gas can be used with safety" for illuminating purposes. The degree of danger in the use of coal gas, water gas, or a mixture of the two, depends largely on the amount of carbonic oxide it contains. It is probably true that the Legislature of 1880 fixed the limit of carbonic oxide at 10 per cent. because that limit was not exceeded in the manufacture of coal gas, and not because it was safe. Many reliable gas engineers now believe, and have expressed the opinion to the members of the Board, that commercial necessities exist at the present time for permitting a larger percentage. The danger which appertains to the careless use of all the gases named is an obstacle, in the minds of the Commissioners, against granting a licence in the form contemplated by the statute. Coal gas is used for illuminating purposes, not by reason of its elements of safety, but because of its ease of distribution, convenience, neatness, economy, and the excellence of its light. Its dangers are widely known. Water gas, or a mixed gas, is somewhat more dangerous; but should its use be wholly prohibited, if the present state of the art shows that in some communities a better and cheaper light can thereby be supplied, and the increased risk can by care be overcome?

In many cities and towns a mixed gas is served, containing from 10 to 20 per cent. of carbonic oxide; in others, water gas having from 25 to 30 per cent. of the same constituent. In these places, as a rule, the question of safety or danger does not enter into the calculation. The managers of the gas companies there simply consider the economy and quality of the light, and the same is true of the consumers. As the accidents are chiefly caused by ignorance or carelessness, the general public feels no alarm, as people do not ordinarily charge themselves with being either careless or ignorant. But all intelligent persons agree that too much caution cannot be exercised. When used by watchful, careful consumers, almost any gas can be called safe; but in the hands of the careless or ignorant, the same gas will be dangerous. The more poisonous gas can perhaps be made practically safe by keeping the gas pipes and fixtures tight, by the use of smaller burners, or by providing ample means of ventilation if the gas by any means should escape.

If a thing in itself be dangerous, the knowledge of its character and a warning in its use are likely to prevent harm. How can a certificate of safety be attached, without misleading the very ones whom it is desired to make more careful? Although a mixed gas, or a water gas, is somewhat more rapid in its poisonous effects, if inhaled, than common coal gas, is it not quite probable that a little more care on the part of those who distribute and use the gas may fully offset the increased element of danger it contains? The mere knowledge that it is more harmful would naturally lead people to be more careful. Some of the accidents are caused by defective fixtures or burners; and these could be inspected and kept in repair. A company might be required to examine them periodically. If the proportion of carbonic oxide be extended, especially to the degree found in water gas, the size and number of burners in sleeping apartments might be limited, and means of ventilation insisted upon. The attention which has of late been called to deaths by the inhalation of gas has led inventors, with more or less success, towards the discovery of some automatic device for closing the pipe or burner, in case the light is blown out, or by some accident the gas is turned on. Something of the kind might be desirable, especially in lodging-rooms. These suggestions are made simply by way of illustration. Other and more effective provisions might be adopted. The Board is firmly of the opinion that the certificate as to safety ought to be omitted from the licence. Such a certificate, it is confidently believed, will in no way serve to protect consumers. The Board respectfully suggests that it should have power to place such conditions in the licence as in its judgment will tend to guard the community against accidents. The licence should also be made revocable, or be subject to modification, as the most practical means of enforcing its provisions and speedily preventing any further danger which might be likely to arise.

For these reasons, a change of the statute is urged upon the attention of the Legislature. The draft of a Bill embodying the views of the Commissioners, is submitted; and the passage of some such Act is respectfully and strongly recommended.

The Bill referred to, which is to repeal the Act of 1888 (cap. 428) above mentioned, which confers upon the Gas Commissioners power, in their discretion, to sanction or prohibit the use of water gas in the State, consists of four clauses only. In the first it is specified that the Commissioners may, on such terms and conditions as they deem prudent, licence any gas company to make and sell water gas for illuminating purposes containing any percentage of carbonic oxide that they may determine; and may, at any time, after notice to a company so licensed, alter or revoke the licence. The second clause is as follows:—"The percentage of carbonic oxide allowed, and the terms and conditions imposed by the Board, shall be stated in the licence, a copy of which the company shall cause to be delivered to each of its consumers; and if the Company holding the licence does not exceed the limit of carbonic oxide so fixed, nor violate any of the terms and conditions contained in the licence, it shall be exempt from any penalty or prohibition provided in section 14 of chapter 61 of the Public Statutes, relating to carbonic oxide." The remaining clauses merely state that the Act of 1888 is to be repealed by the proposed Act, which is to come into operation immediately after its passage.

THE GAS SUPPLY OF SOUTH LONDON DURING THE RECENT STRIKE.

The London County Council and the South Metropolitan Gas Company.

At the Meeting of the London County Council last Tuesday, the Earl of ROSEBERY in the chair—the Sanitary and Special Purposes Committee presented a report relative to the quality of the gas supplied by the South Metropolitan Gas Company during the months of December and January last. It stated that the returns made by the Council's Gas Examiners showed that in the above-named period there had been 43 cases of deficiency in the illuminating power of the gas tested at the various testing-places in the Company's district. They also showed that there had been seven cases of insufficient pressure, and three cases of excess of sulphur in the gas. The Company appealed to the Chief Gas Examiner (Dr. A. W. Williamson, F.R.S.) against these returns, on the ground that the strike of the Company's men threw the operations at the works into confusion; and the Chief Gas Examiner had certified that the deficiencies of illuminating power and pressure, and the excess of sulphur, were occasioned by an unavoidable cause.

On the motion for the reception of the report,

Mr. DICKINSON moved, as an amendment, that the report be not received. He explained that, as the result of the strike of their men, the Company did not do their duty, and thereby incurred penalties because they did not supply gas of the quality and at the pressure required to illuminate the streets. The Chief Gas Examiner had the power to say that such want of proper pressure and illuminating power had occurred from some unavoidable accident; and he had certified that it had so occurred. But he (Mr. Dickinson) thought it ought to be clearly understood by the Council whether or not it was put before him that the "unavoidable cause" was one referring specifically to the manufacture of gas, and not an outside one, which many of them thought it was not. He wished to know whether the Committee and their officers pressed on the Chief Gas Examiner that he was not entitled to call the strike an "unavoidable cause."

Mr. BURNS, in seconding the amendment, said he was convinced that the strike could not be held to be an unavoidable cause. It was undertaken deliberately by the South Metropolitan Gas Company in consequence of a private quarrel with their men; and the Council had no right to take sides either one way or the other. As the Council happened to be representative of the people of London, who, through Vestries and District Boards, had to pay for the gas sold by the Gas Companies, which the Council supervised, he held that they had a right to decide that the strike was not an unavoidable cause of the

deficiencies of quality; and if it were, they ought to insert a strike clause in their contracts with the Companies, which it appeared had not hitherto been done. It was all very well for members who sympathized with Mr. George Livesey and the South Metropolitan Gas Company to say that the mover of the amendment and he (Mr. Burns) were taking sides in this matter, but this was not true. The facts of the case were simply these: Mr. Livesey, as Chairman of the Company, introduced some months ago an arrangement for paying his men, which was not satisfactory to them. The men resisted it, and a strike took place. Incidentally to that strike, the public were inconvenienced. Gas of a bad quality was supplied to them; and as the Council were responsible for the testing of the gas, it was not for them to say whether Mr. Livesey was right or wrong, or whether the gas workers were right or wrong in resisting what he tried to impose upon them. Mr. Livesey had infringed the conditions that the Act of Parliament laid down. He had consequently rendered himself liable to penalties; and he (Mr. Burns) would like to see those penalties imposed, not because it happened to be Mr. Livesey, but because he was the representative of the Company who had not acted up to the standard of their requirements. In the interests of the people of London, they had a right to impose the penalties, or else obtain for the Vestries and District Boards an equivalent reduction in consequence of the bad gas that was supplied.

The CHAIRMAN said he did not think it would be in order to prolong the discussion after the reply of the Chairman of the Committee. They were going very much out of their sphere, because, as a matter of fact, the Chief Gas Examiner was an official of the Board of Trade, with whom the Council had nothing to do, and from whose decision there was no appeal.

Captain JAMES stated that the argument which had been brought forward in support of the amendment had really nothing to do with the case. It was clearly laid down that the decision of the Chief Gas Examiner was final. In this case the Examiner certified; and the Committee acted in the same way as they did in every other similar case—they took neither one side nor the other, but allowed the proceedings to go on automatically.

On a show of hands being taken, the amendment was rejected, and the report adopted.

THE STRIKE IN THE COAL TRADE.

Our Bolton correspondent, writing last Saturday, said: "The great strike in the coal industry had but a brief existence; but the effects upon trade generally have been of a most serious character, particularly in Lancashire and Yorkshire, where numerous mills and other works were brought to a standstill owing to the scarcity of, and the extraordinary prices demanded for, fuel for steam purposes. Never perhaps was coal so much prized as it was during last week; and the avidity with which even the commonest of material was bought up was not the least noticeable feature of the crisis just passed. Last Wednesday prices for all classes of coal in Lancashire had practically doubled; as much as £1 2s. being given for engine coal, and £1 10s. and even more for house coal. Some of the colliery proprietors contented themselves with putting on 2s. 6d. and 5s. per ton; but the majority raised the price as much as 10s. Deliveries of coal, under contract to gas-works, mills, and other factories were suspended from the 15th inst.; and last Wednesday the greatest alarm was felt in commercial circles at the aspect of affairs. Scores of mills in North and North-East Lancashire were closed; and in the Bolton district notices were posted to the effect that a general stoppage of machinery would take place unless the strike was settled. Several gas companies had to lessen their pressure and curtail the supply for public lighting. The Gas Committee of the Bolton Corporation had several special meetings during the strike, and a Sub-Committee was appointed to buy coal wherever possible; there not being more than a day's supply last Wednesday. The Corporation have had to pay 18s. 6d. and 19s. 6d. per ton for coal which in ordinary times would not have fetched more than 6s. 6d. or 7s. 6d., if so much. The public lamps in the town were only lighted for a short time in the evening; and consumers were urged to use the gas as sparingly as possible. Other gas undertakings in Lancashire followed the same course; and matters were assuming a serious aspect on Thursday. The announcement of a settlement of the dispute, therefore, came as welcome relief indeed to most people. Since Thursday prices of coal have fallen to only a fraction above those ruling before the strike commenced. Speaking generally, colliery proprietors and agents in Lancashire have reaped a golden harvest, not only by enhanced prices, but by getting rid of the rubbish which lined their pit banks."

One result of the diminution of the coal supplies last week was to create an abnormal demand for coke; and the price of this article at most provincial gas-works was considerably enhanced. At Rochdale, which may be taken as a typical case, the ordinary day's sale is from 80 to 90 tons. On Monday and Tuesday of last week 153 tons and 203 tons were disposed of; the price being then the ordinary one of 6s. 8d. per ton. On Wednesday, the price was advanced to 10s.; and 215 tons were sold. By Thursday the price was advanced to 15s.; and the sale was 100 tons. There was also a large demand at this rate on Friday. On Saturday the price was reduced to 6s.

Gas Explosion at Harrogate.—Last Tuesday a serious explosion of gas occurred at Hudson's Commercial Hotel, Harrogate. Early in the morning a man named Brown employed in the establishment went into the dining-room, and smelling gas, foolishly went for a light, with the intention of searching for the escape. On his re-entering the room, a loud explosion took place, shaking the building and causing considerable alarm to the occupants of the hotel—most of the visitors being in bed. It was afterwards found that the dining-room windows in the front had been completely shattered, the plaster stripped off the walls, and other damage done. Brown, who was burnt about the head and neck, was removed to the Harrogate Cottage Hospital. The cause of the escape was found to be from the gas chandelier having been pulled down too low.

THE USE OF OXYGEN FOR GAS PURIFICATION AT RAMSGATE.

At a Meeting of the Gas and Water Committee of the Ramsgate Corporation last Tuesday, Mr. W. A. Valon favourably reported upon the Brin apparatus which has been introduced for producing oxygen for the purposes of gas purification. In his report Mr. Valon said: "On Thursday, March 6, the oxygen-producing apparatus was put to work, since which time we have been able to use lime and oxygen for purification, with the result that the illuminating power has been much improved and the use of cannel coal abandoned. Everything in connection with the machinery is working very well, and the heating of the producer is highly satisfactory; the temperature being steadily maintained at 1325°. Combined sulphur in gas each day, under 8 grains. I may mention that the producer was guaranteed to produce 5000 cubic feet of oxygen in 24 hours. By measurement, however, I find that it is equal to a production of 7500 cubic feet per day."

Alderman PYGOTT, Chairman of the Gas and Water Committee, having moved the adoption of the report,

The MAYOR said he was pleased to find that the Brin system of purification was now in full working order at the works. He had to intimate that should any members of the Committee wish to see the system in operation, they had perfect liberty to visit the works; and the Engineer would be glad to explain anything that might be considered necessary.

Mr. EMETT thought the improvement in the quality of the gas was already very noticeable; and his attention had been called to the fact on two or three occasions by ratepayers.

Alderman PEARCE also declared that there had been a great improvement in the gas.

Other members concurred in these remarks; and the report was adopted.

PROVINCIAL GAS AND WATER COMPANIES.

The following paragraphs contain particulars of the results of the working of the Gas and Water Companies referred to during the periods mentioned.

Gas Companies.

The annual meeting of the Sheppy Gas Company was held last Wednesday, when, in moving the adoption of the report and accounts—from which we gave some particulars and figures in last week's JOURNAL—the Chairman (Mr. C. B. Shrubsole) said the consumption of gas had increased throughout their area; the only decrease being in the public lamps at Sheerness, which was the least profitable part of the business of the Company. The Corporation of Queenborough had gone in for more light, and had arranged for their lamps to be lighted the whole of the year, instead of nine months as hitherto. Under the care of their trusted Manager (Mr. W. T. Carpenter), the works had been economically managed, and were withal, in a most efficient condition. The gas rental had not yet increased to the amount at which it stood before the price was reduced to 3s. 3d. per 1000 cubic feet; but it was gradually approaching that total. Several consumers had discontinued the use of oil in their business, and had returned to gas; while a number of small householders, who were welcomed as customers, had commenced burning gas. Every facility was given for the hire of fittings, or the purchase of them under the three years' system. The use of gas-stoves for cooking, &c., was daily becoming more general. As to the residuals, there had been a slight advance in the price of tar; and a better price was obtained for ammoniacal liquor. With regard to coke, he was surprised, looking at it as a cheap article of fuel, that it was not more generally used. As to the discovery of coal in Kent, he could only say that should the day come when they could obtain a supply in their own county, the benefit would all go to the consumers, as the Company could not pay large dividends like some companies; but only the statutory dividends of 10, 7, and 4 per cent. Mr. Brightman seconded the motion, which was unanimously carried. The authorized dividends having been declared, the shareholders thanked the Chairman and Directors, the Secretary (Mr. A. W. Marks), and the Engineer (Mr. Carpenter) for their efficient management of the Company's affairs.

The annual general meeting of the Southend Gas Company was held last Wednesday, under the presidency of Mr. C. Woosnam. The Secretary (Mr. C. J. Dobson) having read the notice convening the meeting, the Directors' report was presented. It stated that the amount available for division was £2161, out of which they recommended the payment of the statutory dividend. Having paid in October last an interim dividend amounting to £680, they suggested the payment of £970, which would complete the yearly maximum dividends; leaving £444. From this it had been resolved to pass the sum of £250 to the reserve fund; leaving a balance of £194 to be carried forward. The report was adopted, and the dividends declared. A question of increasing the Directors fees by £50 per annum was deferred till next year.

The report submitted by the Chairman (Mr. G. Strange) at the recent meeting of the shareholders of the Wimborne Gas Company stated that, after payment of the interim dividend and all other expenses, a balance of £681 remained for distribution. The Directors recommended that out of this a dividend at the rate of 10 per cent. per annum for the past half year, and 6 per cent. per annum on the preference shares, should be declared; that a further sum of £200 should be added to the reserve fund, thus making the total of the fund £700; and that the balance be carried to the trading account for the current year. The report and the Directors' recommendations were adopted.

The annual meeting of the Wrexham Gas Company was held last Wednesday. The Directors reported that there had been a satisfactory growth in the consumption of gas—viz., 3·4 per cent., as against 1·8 per cent. in the previous year; and, upon comparison, the revenue from this source exhibited an increase of £275. A higher price was being obtained for tar and ammoniaca lliquor; but it had not reached the amount anticipated, and which was obtained a few years ago. In June the Directors entered into a twelvemonth's contract for the supply of

coal, but had to submit to an increased rate, amounting to at least £450 per annum. The report was adopted; and dividends of 5 per cent. upon the stock, and 3½ per cent. upon the shares, for the half year were declared, making 10 and 7 per cent. for the year.

Water Companies.

The report of the Directors of the Bristol Water Company for the year ending Dec. 31 last, states that the revenue from water-rates was £85,435; being an increase of £3921 over that of the previous year. The sum applicable for dividend is £21,968; and the Directors recommend that a dividend of 4¼ per cent. on the Company's ordinary £25, £20, £6, and £4 10s. shares be declared, making with the interim payment of 4¼ per cent. a dividend for the year of 8½ per cent., and leaving £3098 to be carried forward. The Directors congratulate the proprietors upon having secured, without opposition, the very valuable powers conferred by the Act of last session, for making a reservoir in the Yeo Valley. The amount formerly held by the Company on loan, they mention has been paid off, and replaced by 3½ per cent. perpetual debenture stock. A contract has lately been entered into with Messrs. J. Watt and Co., of Birmingham, for two double cylinder engines, to be erected at Chelvey, which will afford security against any temporary interruption of the supply in the event of a breakdown of machinery. The capital expended during the past year was £72,472.

The first annual general meeting of the Guernsey Water-Works Company, Limited, was held on Tuesday last, at the London Office, No. 86, Cannon Street, E.C. The chair was occupied by Mr. W. Blaber, one of the Directors, who expressed his regret at the absence of the Chairman (Mr. C. Crew) on account of indisposition. The Chairman, after making a few remarks on the prospects of the Company, stated that the reports from the Engineers (Messrs. Joseph Quick and Son) showed that the works were being proceeded with in a very satisfactory manner, both as to quantity and quality. Many applications for water had been received; and the contractors hoped to have the services laid in the town of St. Peter's Port in about three months. The guaranteed interest on the share and debenture capital had been duly paid by the Contractor. The Auditors (Messrs. Edmonds, Clarke, and Co., and Mr. W. G. Gribbon) were re-elected. In the course of a report presented by the Engineers in November last, they stated that tests had been carried on for some days for the purpose of ascertaining the yield of the well; and it was found to range from 144 to 165 gallons per minute, or 207,360 to 237,600 gallons per day. The adits had then been driven 97 feet in a westerly, and 87 feet in an easterly direction. The western adit did not show much indication of any increase in the flow; but from a small well which had been sunk to a depth of 27 feet, with a 2½-inch bore-hole driven to a further depth of 15 feet in that direction, a large quantity of water was expected to be met with when the heading reached that spot. This was accomplished about the middle of last month, with the result of bringing the flow up to 210 gallons per minute, or rather more than 300,000 gallons per diem. The engine and boiler house is progressing; the reservoir is approaching completion; and upwards of 10,000 yards of mains, ranging from 4 to 10 inches in diameter, have been put down. The adoption of the report and statement of accounts was moved by Mr. Blaber, seconded by Mr. A. Druce, and carried unanimously. A vote of thanks to the Chairman brought the meeting to a close.

ELECTRIC LIGHTING IN NEWCASTLE.

In addressing the shareholders of the Newcastle and District Electric Lighting Company, Limited, last Wednesday, the Chairman (Mr. J. D. Milburn) gave some interesting particulars regarding the progress and prospects of the undertaking. Business, he said, was flowing in steadily. The total number of 10-candle power lamps which could be efficiently connected to the Company's station, as at present completed, would be about 9000; and of these probably not more than 6000 or 7000 would be simultaneously in use—thus leaving one generating machine and boiler always in reserve. Up to the present the Company had connected with their mains 41 installations, representing from 3000 to 4000 10-candle power lamps; and wiring orders had been given for about 1500 or 2500 more, with many others in prospect. It would appear, therefore, that the Company would shortly have more business than they could manage without increasing their generating power; and very shortly it might be necessary to spend more capital. Their present building would permit of the generating plant being doubled; and they had the option of acquiring the building adjacent thereto upon reasonable terms. Including this second building, they would have space for generating plant equal to eight or ten times the present productive power, which would represent something like the simultaneous running of 50,000 lamps, or 70,000 lamps installed. The Managing Director (the Hon. C. A. Parsons) had recently been experimenting with arc lighting in conjunction with the alternating current system, which was the system adopted by the Company; and the Directors believed they would be able to undertake at an early date the lighting of a portion of the city streets where a brilliant illumination was desired. Last year, in announcing the policy intended to be pursued by the Directors, he said that there was no intention to enter into any insane competition, or death-grapple, with gas. It would be some time yet before electricity by incandescent light would vie in cheapness with gas. With arc lighting it was different. There was no doubt that the electric light would cause an increased use of gas in the city; for the brilliancy of the illumination secured by those who used it, would cause the consumers of gas to use much more of that illuminant. He believed that shortly the fire insurance offices would look upon houses lighted by electricity as the safest of their risks. He concluded by moving the adoption of the Directors' annual report, which stated that "it is as yet too early to give an accurate forecast of the financial prospects of the Company; but the Directors have no reason to alter the favourable opinion as to the future of the Company that they have always held." Sir Benjamin Browne seconded the motion, which was carried.

GAS APPLIANCES AT THE ENGINEERS' EXHIBITION.

Were it not for the exhibition appertaining to gas and its kindred trades, we are afraid that the Engineers', Electricians', Builders', and Ironmongers' Exhibition, which was opened at the Agricultural Hall, Islington, on Monday last week, would be deprived of half its attractions. After dusk, the manufacturers of gas-lamps, reflectors, &c., certainly do their very best to outshine their electrical competitors; and the general opinion is that gas holds its own. Then, again, the engineering section of the exhibition is exceedingly poor; and but for the many manufacturers of gas-engines who have entered the lists, the show would be tame indeed.

With regard to the exhibits of those firms who are associated with the distribution and utilization of gas and water, we find at stand No. 5 the firm of Messrs. F. Edwards and Son, stove makers, of Great Marlborough Street, W. In addition to their grates and kitcheners, they make an effective show of Galli and Co.'s gas cooker. This stove is recommended because of the gas being outside instead of inside the oven; and, in addition, hot water is obtained by utilizing the radiant heat. Messrs. Edwards have on view three of these stoves, two of which are in action, including a very large stove adapted for hospitals. The firm claim that they were awarded the gold medal at the Danish Exhibition in 1888 and the Cookery Exhibition of last year; but as this distinguished merit is also held by other firms, it is somewhat peculiar. At stand No. 8, Messrs. Behrend and Co., electrical engineers, of Fore Street, E.C., make a splendid show of their Saxonian bronzeware, including electroliers, chandeliers, wall brackets, table lamps, &c. We noticed specially a very fine bronzed pendant, which might be termed a combined electric and gas candelabra. The wires are run through the ordinary gas-tubes; the only difference being that each bracket would be turned downwards for electricity, and upwards for gas. Some enamelled gas-fittings and an assortment of Rock's patent gas-cookers were also on view. At stand No. 19, Mr. Catterson, of the Globe Lamp Works, Newington Causeway, is doing his best with a very old patent—viz., the "Lux" gas economizer, which is a simple attachment to fit on existing gas-burners to increase the light; and an improvement to the extent of 50 per cent. is claimed as the result of its use. As these economizers are only adapted to two sizes of burner, it seems to us they are somewhat out of date. At stand No. 42, the Champion Gas-Lamp Company make an effective exhibition by putting into use a number of the regenerative gas-lamps. A great improvement has been made in these lamps, especially in regard to the reflector, which cannot fall off when the glass underneath is opened. The flame is white and steady, with a low consumption of gas—only 10 feet per hour in the small, and 14 feet per hour in the large sized lamps. The same Company have introduced a new bye-pass tap, which also serves to regulate the supply to the lamps. At stand No. 48, Messrs. Stanley, Morrison, and Co., of Fenchurch Street, E.C., make a very fine show of india-rubber goods, gas and water tubing, asbestos, belting, &c., which deserved greater attention than was bestowed upon them by the visitors when we were at the exhibition. At stand No. 58, Mr. S. Buckley, of the Hooley Hill Tool Works, near Manchester, shows a very large assortment of gas-fitters' and engineers' tools, including stocks and dies, tube-vices, and main-drilling apparatus, all of which are very interesting. At stand No. 69, Messrs. Henry Greene and Son, of 155, Cannon Street, make a splendid show with their "Meteor" high-power gas-lamps, and among which is to be seen their latest novelty—the storm-proof lamp—which was recently described and illustrated in the JOURNAL (*ante*, p. 110). All these exhibits are shown to perfection at night time. At stand No. 82, Messrs. John Wright and Co., of London and Birmingham, exhibited their enamelled steel-lined "Eureka" gas-cookers. The latest improvement effected in these stoves is the addition of a sliding iron panel, in order to partly cover two of the top burners, thus causing the flame to deflect on to the grill. The pan underneath has also been deepened 2 inches, so that toast on a stand can be done in 25 seconds. At stall No. 95, Messrs. James Stott and Co., of Fleet Street, E.C., show their well-known automatic gas-governors and the Stott-Thorp reflex sun-light. Both of these appliances have been mentioned in connection with previous exhibitions; and therefore do not require to be further described. One very large sun-burner, consisting of seven groups of eight burners under one enamelled cone, attracted attention. This adaptation of the arrangement for clusters, as in theatres, is found to be of much value, especially if the consumption of gas is taken into account. The light afforded is very brilliant; and this has led to the adoption of the sun-light in three theatres in Manchester, as well as in other places. At the Theatre Royal, Manchester, the old cluster contained 252 ordinary burners, as against 56 of the Stott-Thorp gas-burners; and the illumination afforded is equal. At stand No. 98 the Incandescent Gas-Light Company make a feature of their speciality—the Welsbach burner. Several improvements have been made in this burner; and although the firm may be regarded as somewhat bold in announcing it to be a "triumph of gas lighting," the quality of the light, and the adaptability of the appliance to existing lamps, give the burner a status in the market. At stand No. 102, the Shaw patent gas-governor, for which Mr. Thomas Newbigging, M. Inst. C.E., has given a written testimonial, is on view. At stand No. 106, Mr. H. Müller, of Mary Ann Street, Birmingham, is trying his best with his "Alpha" gas-making machines; but we are afraid that the gas industry is in too forward a position for people to want to make their own gas, except under peculiar circumstances. Mr. Müller's inventions, especially his automatic public lamp regulator, are, however, very ingenious. At Messrs. Dick's Asbestos Company's stand (No. 107), we found a good assortment of packing—self-lubricating, steam, and hydraulic pattern—for which there should be a great demand. At stand No. 112 is to be seen a new invention in the gas-engine world—that of Messrs. Fawcett, Preston, and Co., of Liverpool. It is a miniature engine, named the "Fawcett." At present there is only one—a 4-horse power—in London; but there are many larger ones in Liverpool. It is claimed that for a 6-horse power brake only 24 cubic feet of gas per hour are required; for an 8-horse power, 26 feet. This is indeed very low. The engine appears to be simply

constructed, starts very quickly, and does not cause trouble with the valves. The exterior finish of the engine is not good as compared with others; but this is a matter which can be soon remedied by the makers. At stand No. 144, the Campbell Gas-Engine Company, of Halifax, are showing six engines. A ½-horse power engine was driving a band saw; while the 4-horse motor was effectually supplying power for printing the *Exhibition Daily Press*, and working a platen printing-machine. At stand No. 148 the Thomas Lighting Company, of Carthusian Street, E.C., make a very fine show of the regenerative lamps bearing their name. These are after the style of the Wenham lamps, and are very highly decorated. A new lamp for fitting on ordinary brackets, and a wind-proof lamp for outside use, are demonstrated to the satisfaction of the general public. Amongst the gas-engines we were pleased to see the exhibits of Messrs. Crossley Bros., who were running five of their world-renowned motors—a 14-horse power driving 30 of the Thomson-Houston arc lights, calculated at 12,000 candle power. The British Gas-Engine Company, of Gospel Oak, have two of Atkinson's patent "Cycle" engines; and Messrs. J. E. H. Andrew and Co., of Reddish, show to advantage four of their famous "Stockport" engines. The "Griffin" gas-engine is also on view; the makers (Messrs. Dick, Kerr, and Co., of Queen Victoria Street, E.C.) exhibiting five engines, ranging from ½-horse power upwards.

On making a second visit to the exhibition, we found several additions which deserve mention. Messrs. Botting and Co., of Sydney Street, S.W., impress upon the public the advantages of their duplex gas-burner, for which a number of medals have already been awarded. A very fine show of lamps and metal work is that of Messrs. Dunaway and Son, of Hornsey Road, N. The important part of their exhibit is the "Noctilugue" patent reflecting and advertising lantern for shop-front lighting. It is fitted with enamelled cone, permanent advertising tablets, copper hurricane top, and patent gas-regulating burners. The lantern is made to be taken in, or can be adapted to ordinary fittings. A novelty for gas and water companies is the automatic time-checking machine by Messrs. Stockall, Leber, and Son, of Goswell Road, E.C. This arrangement allows workmen to put their check into a box, which automatically registers the time the person started work, and so avoids disputes. A clerk can in a few minutes book the time of the whole of the workpeople from the tickets in the drawers. Another novelty was Ryland's patent glass-lined tubing, from 62, King William Street, E.C. All sizes of iron tubing are coated internally with solid glass tube, which, in the interests of purity (especially of water and chemicals) is said to be valuable. The pipes are also adapted for conveying electric wires; the glass being a non-conductor. At the stand of Messrs. John C. Onions, Limited, a feature is made of a portable forge, adjusted to which is a powerful atmospheric gas-blower, which makes white hot any kind of iron for forging purposes. For smiths' shops in gas-works, we should say this forge would be exceedingly valuable.

The exhibition remains open until Friday next.

GAS EXHIBITS AT THE NEW ZEALAND AND SOUTH SEAS EXHIBITION.

The Exhibition now being held in Dunedin (N.Z.), to which reference has already been made in the JOURNAL, has afforded the Corporation of that city, who are the owners of the gas-works (Mr. D. A. Graham being the Engineer and Manager), an excellent opportunity of showing the residents and visitors the various economic uses to which gas can now be put; and they have availed themselves of it in a most praiseworthy manner. A large space in the building has been allotted for the purpose; and this has been filled with samples of the best and most improved appliances for the utilization of gas for lighting, heating, cooking, and motive power. The Corporation are not themselves the importers of the exhibits; nor do they sell any of them. Their work is, so to speak, of a purely educational character; any business that may result therefrom being left to private enterprise. It is well known that the general public are to a large extent ignorant of, or indifferent to, the value of gas in a great many operations wherein it will render good service; and consequently the fact has to be brought home to them by demonstrations at exhibitions. This course has been found to be attended with beneficial effects in this country and on the Continent; and there is little doubt that similar results will follow its adoption in the Colonies. The cooking and heating appliances comprise kitchen ranges; stoves for drawing-rooms, bedrooms, halls, offices, churches, and laundries; bath heaters, smoothing-irons, blowpipes, boiling-burners—in fact, every kind of appliance by the aid of which gas can be profitably employed. Its use for motive power is shown by a 2-horse power "Otto" and a 1-horse power "Stockport" engine—both good representative motors.

In connection with this short notice of the appliances for the utilization of gas, it may not be out of place to refer to the fine collection of coal exhibits displayed in the New South Wales Court. The coalfields of the Colony are very extensive; being estimated to occur over 23,950 square miles of country. The principal beds exist along the coast to the north and south of Sydney, and in the districts tapped by the great northern, western, and southern railway lines. According to Mr. C. S. Wilkinson, the Government geologist, the upper coal measures are 480 feet thick, resting conformably on the marine beds of the lower coal measures, and overlaid by about 500 feet of Hawkesbury sandstone. The production of coal has increased with amazing rapidity of late years. Several very valuable seams of oil shale have been discovered; and the shale from two of them is retorted for the manufacture of kerosene oil. These shale seams vary in thickness from a few inches up to 5 feet. The total production of coal over the colony up to Dec. 31, 1887, was upwards of 39 million tons, valued at over £19,000,000; while 481,252 tons of petroleum shale, valued at £1,083,174, were raised. The coal exhibits are so arranged as to give a faithful representation of the quality of the mineral and the depth of the various seams. A very striking exhibit is that of the Australian Kerosene Oil and Mineral Company. From the Company's mine at Joadja Creek, samples of petroleum shale have been taken. Near at hand an exhibit of kerosene shale from the Katoomba Company is arranged on a stand. The next exhibit is that of the Hartley Vale Shale and Oil Company—a vertical section of the deposit, which is 2½ feet thick, being shown. Some very fine-looking shale comes from the Sugar Loaf, Boghead, Gas and Mineral Company's deposits in the Western coalfields. The shale exhibits are all highly interesting as indicating the mineral wealth of the Colony. The coal exhibits mostly show vertical sections of the strata in large blocks. They are finished off by a very instructive trophy at the end of the mineral collection. It illustrates the products of the various coal mines over the colony, and shows the depth of seam in the several mines. The base of the trophy is made up with coke, while the different kinds of coal are arranged above. A study of the trophy shows that the great Borehole seam of coal runs from 10 feet to 22 feet in thickness; the Burwood seam is 5 feet; the Singleton, 7 feet; the Greta, 16 feet; the West Maitland, from 3 feet to 5 feet; the East Maitland, 2½ feet to 5 feet; the Lake Macquarie, 13 feet; the Lithgow Valley, from 6 feet to 10 feet; the Katoomba, from 6 feet to 7 feet; the Hartley Vale oil shale, 5 feet; and the Joadja Creek oil shale, 1 foot 8 inches to 2 feet 3 inches. The exhibits constitute a very important portion of the mineral collection shown by the New South Wales Department of Mines.

STAFFORD CORPORATION WATER SUPPLY.

Inauguration of the New Water-Works.

Monday last week was observed as a general holiday in the town of Stafford. The shops were closed; flags were displayed in great profusion; and the church bells were rung at intervals—all tokens of some extraordinary occurrence calculated to give rise to much public rejoicing. The cause of the jubilation in this ordinarily steady-going Midland borough was the completion of the water-works, which have been a source of much anxiety to the Corporation. The history of the undertaking is unique; it is a record of repeated failure, steady perseverance, and final triumph. It is 13 years since the Corporation of Stafford commenced searching for water; an attempt being made in 1877 to construct an artesian well on Stafford Common. After spending £15,000 on the work, it had to be abandoned; yielding for the outlay only a number of interesting data in regard to the geology of the district. None of the borings made ever went lower than 770 feet, owing to the difficulties caused by veins of rock-salt occurring in the marl. The next experiment was at Enson Moor—some four miles to the west of the town—in similar strata to that at the Common. The marls were passed through successfully by means of a deep ironclad well, and the rock was penetrated to a depth of about 800 feet—only, however, to find that the supply of water yielded from the boring was of a very salt and brackish character. Eventually the idea of boring on the west side of the great fault which occurs in the triassic formation of marl to the east of Stafford was given up, and the Corporation resorted to experiments on the east side. The site of their first experiment was at Milford, on the edge of Cannock Chase, where the Bunter rocks lie close to the surface. Within a very short time they sunk a well which yielded a large quantity of extremely pure water. This is the site on which the present works have been erected. The land was obtained from the Earl of Lichfield on reasonable terms; and during the past year a pumping-station and reservoir have been in course of erection. The reservoir is situated on the top of one of the high spurs of Cannock Chase, and has a fall into Stafford of some 220 feet. Since the inception of the undertaking which has now been successfully completed, something like £42,000 have been expended; and it is gratifying that at length some tangible return is being obtained. The site of the works cost £600; the buildings at the pumping-station, £3295; the reservoir, which is capable of holding 577,575 gallons, £2692. There are 7½ miles of mains, the contract for which came to £5962. The ceremony of starting the machinery at the pumping-station was performed by the Countess of Lichfield, in the presence of the Mayor (Mr. Alderman Amies), the members of the Corporation, the Earl of Lichfield, and a large number of visitors. At its conclusion, the Chairman of the Water Committee (Mr. J. C. Mycock) proposed a vote of thanks to her Ladyship. This was seconded by Mr. Alderman W. H. Peach, who remarked that the Corporation had adopted Lord Lichfield's motto, "*Nil Desperandum*," during their search for water; and they were pleased that, through his Lordship's kindness, they had been able to bring the work, after many disappointments, to a successful issue. The Earl of Lichfield acknowledged the vote on behalf of the Countess. The party then adjourned to the reservoir, where the Earl turned the water into the mains; at the same time expressing the hope that the stream which he had set flowing into Stafford that day would result in increased prosperity, health, and happiness to the inhabitants. After this the party proceeded to the borough boundary at Queensville, where the Mayor performed the operation of turning the water into the borough. This done, a procession was formed, headed by the Volunteer Band and the local Fire Brigade, and walked to the Market Square, where, in the presence of a vast concourse of people, the Town Clerk (Mr. M. F. Blakiston) presented the Earl with an illuminated address, in recognition of his kindness and liberality to the town. His Lordship, having thanked the Corporation for their gift, the Mayoress presented the Chairman of the Water Committee with a silver key with which to open the first hydrant in the Square; but, owing to the bursting of one of the mains in the vicinity, this part of the programme had to take place in Lichfield Road. Subsequently, experiments were made by the Fire Brigade to test the force of the water in overtopping various buildings in the main streets. In commemoration of the opening of the works, a public dinner was held at the Swan Hotel—the Mayor presiding; at five o'clock a tea was given to all the old people in the borough; and in the evening a free dance took place.

Gas Supply in Indiana.—Some big financial transactions have lately taken place in connection with the supply of gas in Indiana. Something like a dozen of the leading natural gas companies in the State have amalgamated, and will work with a capital of £700,000. The monopoly of supplying gas in Indianapolis has just been acquired by a Syndicate for £400,000.

WATER COMPANIES' CHARGES.

A Meeting, convened by the Rate and Tax Payers' Assessment Protection Association, Limited, was held last Friday evening, at the St. James's Hall, Piccadilly, to discuss and pass a series of resolutions on matters dealt with in a short introductory paper read by Mr. J. J. HITCHINGS (Ex-Crown Surveyor), who is the Managing-Director of the Association. Mr. E. C. KEEVIL presided.

Mr. HITCHINGS's paper was mainly devoted to an examination of the present system of assessing income-tax. To assess income-tax upon the gross annual value of houses and lands, he considered was unjust and inequitable, and he held that the tax charged under Schedule A, should be assessed upon the net annual value, after allowing the average yearly cost of repairs, insurance, and other necessary expenses (if any) of maintenance. The payment of inhabited house duty upon tenements was also dealt with; and the charges of water companies received passing reference. On this subject he said, if he might allude to a question which Mr. Dobbs had made peculiarly his own, he would point to the injustice of assessing water-rates upon the annual value of premises. This referred particularly to large blocks of offices and warehouses, where only a little water was used; and yet the water-rates were assessed on the full annual value. A case was mentioned to him a few days previously, in which a gentleman calculated that, in business hours, each time he washed his hands, it cost him a sovereign.

Sir JOHN CAMPBELL, Bart., subsequently moved the following resolution:—"That the operation of section 68 of the Water-Works Clauses Act of 1847 (whereby it is enacted that the charges for water shall be payable according to the annual value of the tenement supplied with water), and of similar provisions in the Water Companies' Acts, is attended with grievous injustice to a large section of the consumers, and that the effect of the quinquennial revision of the Metropolitan Valuation List periodically possesses the Water Companies at the expense of the consumers of an enormous unearned increment not contemplated by the Legislature when the Act of 1847 and subsequent Acts were passed." In support of his motion, Sir John remarked that the supply of water and the price paid for it were both questions of the greatest importance to all persons, whether they resided in large or small houses. He contended that it was unjust that occupiers of large houses should be compelled to pay higher rates than those of small houses, because it did not always follow that the inhabitants of a large house would use more water than those of a small one. Therefore some revision of the water-rates was required. In his opinion, however, the right mode of charging for water would be by measurement, in the same way as the gas they consumed was registered.

Major CRESWELL, in seconding the resolution, also maintained that the present system of levying water-rates was inequitable. As an illustration, he took the houses in the street where he resided, and compared them with those in Regent Street. In his own house he had taps, closets, baths, and so on, and was regularly assessed (say) at £100 or £150. He probably consumed the same amount of water as a house in Regent Street which was merely occupied as a shop, and was assessed at £4000 a year. Now, to his own knowledge, places of that description had only a lavatory in which the assistants washed their hands; and it was a monstrous state of things that occupiers of such premises, in which during the daytime they carried on businesses from which they derived their daily bread, should have to pay on such an enormous assessment, while they did not consume more water than a family with half-a-dozen children and servants residing in a comparatively small house. In conclusion, he characterized the present system of charging for water as "a most hideous thing."

Mr. A. A. FREY said he wished to move an amendment to the resolution. He held that the question of the water supply was really one of greater interest than that of income-tax; inasmuch as one affected their health and the other simply their pockets. The water supply, to his mind, was too important a matter to be left in the hands of private Companies. Water was a necessary of life; and that Companies should be allowed to make a large profit out of a common necessity, surpassed his understanding. The water which was delivered in London was derived from the Thames; and every year the river was becoming more polluted. The supply being in the hands of private Companies, the consumers would never obtain purer water than at present. If the supply were in the hands of some public authority—he would not say the County Council, though he supposed that would be the proper body—he believed better water would be supplied; and a fair profit could be made, which would relieve the community of a part of their taxation. Another point was this—that water should be charged for according to the amount consumed. There were several very excellent meters in the market, which were as suitable for small as for large establishments. The amendment that he wished to propose was as follows:—"That the water supply to the community at large should not be left in the hands of private Companies, but should be in the hands of Municipalities or Councils, and that water should be charged for according to the quantity consumed, which should be ascertained by meter."

Mr. GILBERT ELLIOTT seconded the amendment; but not because he agreed with the latter part of it. He was now being supplied with water through a meter; but when he adopted the meter, the Water Company (to use his own language) "held a pistol to his head," and compelled him to agree to pay for a minimum quantity of 43,000 gallons per quarter. Thus he had to pay for 172,000 gallons per annum, while he only used about 25,000 gallons; so that the meter was of no use whatever to him.

It was suggested that the amendment should be added as a rider to the resolution; and the meeting having assented to the proposal, the resolution in its enlarged form was passed.

Mr. W. H. LEFEVRE, in proposing a vote of thanks to Mr. Hitchings for his paper, observed that he thought the existing system of levying water-rates was "abominable." Referring to the building in which his offices were in the City, he said he supposed it cost something like £100,000; and the water-rate was levied upon the full value of the building. A gentleman had assured him that, whenever he washed his hands on his business premises in the City, it represented an expenditure of about £50! He certainly thought the system of levying these rates should be adjusted. Some allusion had been made to the supply of water by meter; but, unfortunately, there was not a really perfect meter to be obtained—there was no meter which would register equally well at high and low pressures.

Mr. FREY seconded the proposition, which was unanimously carried.

Resolutions dealing with the questions of income-tax and inhabited house duty on tenements were also passed; and it was agreed to appoint a deputation later on to bring the various resolutions before the Government.

METROPOLIS WATER SUPPLY.

The Quality of the Water during the Month of February.

The returns furnished to the Registrar-General by the London Water Companies on the water supply of the Metropolis during the past month show that the average daily supply was 159,851,698 gallons, being at the rate of 27 gallons per head of the population, as compared with 26·8 gallons in February, 1889. Of the entire bulk of water sent out, 79,095,922 gallons were drawn from the Thames, and 80,755,776 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was: Kent, 0·4; Colne Valley, 1·9; Tottenham, 2·0; New River, 2·6; Southwark, 3·1; Chelsea and Lambeth, 3·5; East London, 3·8; Grand Junction, 4·1; and West Middlesex, 5·0. The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was, with the exception of that delivered by the West Middlesex and Grand Junction Companies, of much better quality than that supplied in January, when organic impurity was present in abnormal quantity. The water was in every case efficiently filtered. The water obtained chiefly from the River Lea by the New River and East London Companies, though better on the average than Thames water, exhibited no corresponding improvement in comparison with the January supply. It was efficiently filtered. The deep-well waters of the Kent and Colne Valley Companies, and of the Tottenham Local Board of Health were of their usual high degree of organic purity; the Kent Company's supply being again especially distinguished in this respect. The Tottenham water showed a large increase in nitrates, chlorine, and hardness. These waters do not require filtration; they were all clear and bright."

Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner (General A. de Courcy Scott) on the quality of the daily samples of water supplied in London during February, say: "Judged by the determinations of colour tint, and of oxygen required for oxidation, the character of the water supply to the Metropolis during the month of February scarcely differed appreciably from that manifested during the previous months of December and January. But the proportion of organic carbon found in the water, though still low, both absolutely and in regard to the period of the year, has not continued to be of the exceptional degree of lowness for the season taken note of in our reports for the previous two months. As regards the Thames-derived supply, the mean proportion of organic carbon was found to be ·160 part in 100,000 parts of the water, with a maximum of 1·74 part in any single sample examined; this maximum proportion of organic carbon corresponding to about 0·3 grain of organic matter in 70,000 grains (*i.e.*, a gallon of the water)."

Shanghai Water Company, Limited.—The annual general meeting of this Company was held last Wednesday, when the report of the Directors was adopted, and dividends of 20s. per share on the old, and 13s. 9d. per share on the new shares, were declared; making, with the interim dividend declared in August last, 8 per cent. on the working of the year 1889. A final call of £5 per share on the issue of shares in 1887 was also announced.

The Water-Gas Plant at the Leeds Forge.—Speaking at the recent annual meeting of the Leeds Forge Company, Limited, the Chairman (Mr. John Scott, C.B.) remarked that water gas had been used at the works for nearly two years; that it had worked with most admirable regularity; and that it had effected a large saving in fuel and labour. He believed that before the next meeting, the water-gas plant would be doubled, if not trebled.

The Recent Strike at Salford.—The Elective Auditors of the County Borough of Salford have been making investigations into the cost of the late strike of gas workers. It is stated that a sum of £2203 6s. 2d. has been paid for meat, groceries, provisions, tobacco, wages of carvers, waiters, and assistants, &c., and that other payments have yet to be made which will no doubt make the aggregate considerably over £2500. This expenditure represents the cost of feeding the men who supplied the places of those who turned out, and who boarded and lodged on the works till the trouble was at an end.

The Payment of Water-Rates by Landlords.—A case of some importance to residents in small houses came before His Honour Judge Homersham Cox, at the Sevenoaks County Court, last Thursday week. The defendant—a Mr. Gillett—occupied a house in the town, and was supplied with water by the local Water Company. He had an agreement with the landlord to pay the water-rates in his rent, and accordingly did so. The landlord became a bankrupt; and the Company sought to recover the sum of £1 3s. 4d. for water used by defendant. The representative of the Company cited the clause of their Act which states that the rates should be paid by persons requiring, or receiving, or using a supply of water. Defendant said he did not object to the Company's charges; but he had paid the rates in his rent to the landlord. His Honour admitted that it was hard upon defendant; but it was clear the Company had authority to demand the rates. Having his decision on that point, he thought it would be graceful on their part not to apply for costs. This advice was readily accepted.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

The Board of Trade appear to be a good deal perplexed over the question of who is to be the "local authority" under the Electric Lighting Acts. A fortnight ago it was given out that they had agreed to place the responsibility first upon Gas Commissioners, failing them upon Police Commissioners, and failing them upon Town Councils. They have now transmitted to local authorities a Draft Bill to amend the Acts of 1882 and 1888, as applicable to Scotland. The new proposal reverses their former one, and places the Police Commissioners in any district, or the Town Council, as the local authority, with the power of delegation to enable the Police Commissioners or Town Council to resolve at a special meeting to declare the Gas Commissioners for the district the lighting authority. It is also provided that one month's notice must be given of such a resolution in the *London Gazette*. This would enable the Corporations of Edinburgh and Leith, if they considered it desirable, to declare the Gas Commission the local authority for electric lighting in Edinburgh and Leith. The subject was reported to the Edinburgh Town Council on Tuesday, when it was resolved to assume the duties of local authority at once. Their first duty, according to Mr. Kinloch Anderson, will be to oppose the Electric Lighting Companies who are seeking jurisdiction in the city; and it was also stated by Mr. Macnaughton, who is a Gas Commissioner, that the Gas Commissioners would now, no doubt, withdraw their opposition. On the same day, the Leith Town Council discussed the subject. Bailie Archibald moved that, considering that the interests of the ratepayers of Leith are bound up with those of Edinburgh in the gas undertaking, and that any separate action on the part of the Corporation or of private companies, in the introduction of electric light into a portion of the district supplied with gas by the Commissioners, might be injurious to the ratepayers generally, they were of opinion that the Gas Commissioners should be the local authority under the Acts, and that the introduction and supply of electric light within the district should be entrusted to the Gas Commissioners. A counter-motion agreeing to the course which had been adopted earlier in the day by the Edinburgh Town Council was moved, and was adopted by nine to seven votes; so that Bailie Archibald's proposal (which, in the circumstances, was the only workable one) was lost.

Mr. J. B. Balfour, Q.C., who was Lord Advocate in Mr. Gladstone's last Government, has introduced a Bill into Parliament dealing with the question of the lighting of common stairs. This measure consists of a single clause, and empowers the Commissioners of Police of any burgh to contract for or supply gas or other light for common stairs, passages, and private courts, and to clean, light, and extinguish the lamps by their servants, and recover the expense from the owner of the building. This is probably the easiest solution of a question which is not unattended with difficulty; but it is doubtful whether Parliament will pass the measure, because it would confer power upon the Police Commissioners to enter upon the property which, though common to the parties living in it, is nevertheless private. To be sure the Legislature is not so careful of the rights of property as it once was; but it may be taken as significant of the view which a Conservative Government takes of the subject, that it has been left to a member of the Opposition to introduce it. Parties interested may calculate the chance of the Bill passing a good deal upon that circumstance.

The Falkirk district seems to be growing rapidly. At present a large system of water-works for the district is being constructed. This week a House of Lords Committee has passed a Bill for the extension of the boundaries of the burgh of Falkirk; and it is also announced that a voluntary system of lighting for the neighbouring district of Larbert has been successfully completed. The lamps were lighted for the first time last week. It is announced that the lights run almost from one end of the parish to the other. From Larbert to Carron, a long stretch of country road, is now under gaslight. Such a sight is an unwonted one, and surely points to municipal powers being sought for the district in the near future. No better indication could be had of its prosperity.

The North Berwick Gas Company, after seeing the Police Commissioners through their flirtation with an electrical firm, have lost no time in placing an order for the erection of a new gasholder, in extension of their plant. The new holder is to be of 25,000 cubic feet capacity. At present the town is served with one of 16,000 cubic feet. Mr. Balfour, of Leven, has secured the contract. It is significant of how little the ordinary newspaper reporter knows of technical affairs, that it is announced in a local paper that the holder is to be built at Leven, and taken across the Firth of Forth in a steam launch.

The action which I stated a few weeks ago had been raised in the Court of Session by Mr. A. Drummond, of No. 166, Perth Road, Dundee, against Messrs. T. Fletcher and Co., gas engineers, Warrington, has been settled. Pursuer wanted £5000 as damages for an alleged infringement of a patent he holds for the improvement of heating surfaces—the invention consisting of enlarging the surface by means of projections upon it. Defenders replied that the method of increasing heating surfaces was known long prior to the date of the patent. By the agreement which has been come to, defenders have paid £20, for which they obtain absolvitor, and are entitled to manufacture, sell, and advertise the apparatus described in the letters patent, without the permission of the pursuer. Neither party got expenses against the other.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

I am told that an intimation has been received by the Glasgow municipal authorities from the Board of Trade to the effect that the Bill for the extension of the municipality will have to be considered and resolved upon by the Committees of the two Houses of Parliament before any decision can be given upon the Electric Lighting Provisional Orders that have been applied for by the Partick, Hillhead, and Maryhill Gas Company and the Kelvinside Electricity Company. I do not know how the Directors of the Gas Company have received, or will receive, this information; but I hear that it has given very considerable dissatisfaction to Mr. J. B. Fleming, who is the leading spirit in the Electricity Company.

I may here mention that in reference to the administration of the Electric Lighting Acts there is some correspondence going on between London and Glasgow which seems to indicate that the Lord Advocate, as principal Law Officer for Scotland, is very likely to make an effort to amend the Act of 1888 to the extent of declaring what existing body, in such towns as Glasgow, shall be called upon to take lawful control of electric lighting—the Town Council, the Police Commissioners, or the Gas Commissioners.

It seems that there are upwards of thirty applications for the Glasgow gas managership which has become vacant by the resignation of Mr. David Terrace, who has had charge of the large works at Dawsholm for the past nine or ten years. A list of five has been prepared by a Special Sub-Committee of the Gas Committee; and this list will be submitted to a special meeting which is to be held on Monday. It is considered very probable that instructions may then be given for the further reduction of the number, and that those persons whose names then remain on it may be interviewed prior to the holding of the next ordinary monthly meeting of the Gas Committee. The vacancy is causing great interest among gas managers both in Scotland and in other parts of the kingdom; as the appointment is regarded as one of the "plums" of the second grade in the gas profession.

I have this week been able to secure some interesting statistics in regard to the progress of the principal suburban gas concern that Glasgow has to contend with. During the eight months ending on Feb. 28 the quantity of coke sold by the Partick, Hillhead, and Maryhill Gas Company was 9278 tons more than was sold in the corresponding eight months of 1885-6. The amount of tar and liquor sold in the same period showed an increase of 820,000 gallons, while the amount of gas made in the eight months showed an increase of 58¼ million cubic feet, as compared with the make in the same portion of the financial year 1885-6. These few statistics seem to indicate that if the electric light is to be the "light of the future" it will have to make rapid strides, even in order to keep pace with gas; for while the consumption of gas supplied by the Glasgow Corporation Gas Commissioners has increased from about 1500 million feet per annum some seventeen years ago to something like 3000 million feet in the present financial year, the consumption of gas made by the suburban concern just mentioned has increased about 300 million feet during the same period. Indeed, the increase would have been still greater had it not been that pressure had to be considerably diminished in the beginning of last winter until the new retorts could be got ready for active service. It is impossible to conclude from these statistics that the gas industry is going to collapse in the immediate future.

Mr. James Donaldson, the new Manager of the gas-works at Cambuslang, has this week been admitted to the membership of the Philosophical Society of Glasgow. He was recommended for election by Mr. W. Key, of the Tradeston Gas-Works, and by two of the Directors of his Company, one of whom, Dr. Henry Muirhead, is the Chairman of the Company, and a Past-President of the Philosophical Society.

It may interest many persons who knew him to learn that the late Mr. James Stewart, of the firm of A. and J. Stewart, the well-known malleable iron tube manufacturers, was worth at his death, which occurred a few weeks ago, upwards of £153,000. Both brothers began in a very humble way their connection with the malleable iron tube trade of Scotland; but the business which they established has since become one of the most extensive of the kind in the kingdom.

One of the oldest and best-known citizens of Kilmarnock, Mr. Peter Ritchie, died at his residence last Monday, at the ripe age of 78 years, after an illness lasting some months; and his death severs another link binding the present with the past history of the town, in connection with the public affairs in which he for a number of years played a not inconsiderable part. The deceased was one of the largest shareholders in the Kilmarnock Water Company and took a prominent part in its management. He first became connected with the Company 25 years ago; and in 1867 he was appointed Chairman—an office which he continued to hold for 18 years. During his term of office as Director and Chairman, the Company's Acts of 1866 and 1875 were passed, and many important extensions were made in the water-works. Though his fellow Directors might not always have agreed with his methods, no one can deny his entire devotedness to the interests of the Company, which he lived to see successful to an extent probably beyond the most sanguine hopes of the founders. The shareholders, not slow to recognize his services, last year presented him with a valuable portrait of himself, excellently painted by a fellow-townman, Mr. Alex. S. Mackay.

The report on the condition of the local sulphate of ammonia market states that a greater readiness on the part of both makers and merchants to meet each other's ideas has been noticeable this week; and that a fair amount of business has been done. Transactions have taken place at £11 and £11 16s. 3d. per ton f.o.b. at Leith; and at about 2s. 6d. per ton more for Glasgow.

The price of Scotch iron dropped last Monday to 50s. 4½d. per ton cash; but it gradually improved till yesterday afternoon, when 51s. 8d. per ton was paid. Special brands for shipment seem to be in better demand, and in the case of Eglinton and Gartsherrie Nos. 1 and 3, the price has advanced 1s. per ton within the past day or two. There has been a decrease in the stocks in the public market stores this week to the extent of upwards of 11,000 tons.

In the local coal trade there is comparatively little change to report. Prices are firmly maintained; and the miners have been encouraged by the success of the movement in England to press their claims for an advance of wages. The shipments are on a very considerable scale, and some large orders for the English industrial districts have been implemented during the week.

The Suggested Purchase of the Cardiff Gas-Works by the Corporation.—It is reported that the proposal of the Cardiff Corporation to purchase the gas undertaking has met with so much disapproval from the ratepayers, that they have resolved to abandon it. The shares, which were rapidly increasing in value when it was believed that the Corporation intended to acquire the undertaking at "a 27 years' purchase," are now falling to their normal state.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March 22.*

Sulphate of Ammonia.—The market can hardly be said to be brisk yet. There is an under-current of firmness which may shortly develop into an increased demand. The parcels offered during the week have been somewhat more numerous; but the bulk has changed hands at rates above those which are stated as ruling in the open market, showing there were necessities which buyers have been anxious to cover in as quiet a manner as possible. It would seem that dealers are taking their cue from the quieter aspect of nitrate, by again making offers abroad at rather lower rates. But these tactics may not eventually meet with success; and it is entirely in the hands of manufacturers whether or not they will succeed. The business at Hull has been at £11 17s. 6d., although something less than this is reported for inferior makes. The Liverpool Dock Strike having in a measure terminated, shipments have been partially resumed; prices showing an improvement—local makes having brought the parity of £11 15s. to £11 16s. 3d. f.o.b. The unprecedentedly large arrivals of nitrate cargoes off-coast (about the heaviest on record) had a detrimental effect on prices; but as deliveries have been on a very large scale, there is some recovery from the lowest point. The value of cargoes at port of call is 8s. per cwt.; and on spot the quotations are a shade lower this week, at 8s. to 8s. 1½d.

Increase in the Price of Gas at Howden.—In consequence of the increase in the price of coal, the Howden Gas Company have raised the price of gas 10d. per 1000 cubic feet (from 4s. 2d. to 5s.), as from the 15th prox.

Proposed Extension of the Colne Gas-Works.—At the last monthly meeting of the Colne Local Board, a resolution was adopted sanctioning application to the Local Government Board for the borrowing of £5000 for the purpose of extending the gas-works—a step rendered necessary by the increasing population of the area of supply and the district generally.

Sales of Shares.—Last Tuesday, £420 stock in the *Kirkham Gas Company* was offered for sale. Eight lots of £50 realized from £80 to £81 17s. 6d. each; and the remaining £20 was sold for £35 5s. The competition was keen.——On Thursday, some £60 "A" stock in the *Preston Gas Company* realized £132; and £525 "B" stock in the same Company was sold at the following rates: £100 for £135, three lots of £100 at £154 each, £125 for £194, and £60 for £93.

Increase in the Price of Gas in Dublin.—The Directors of the Alliance and Dublin Consumers' Gas Company have given notice that they intend to raise the price of gas 3d. per 1000 cubic feet as from to-day. The reasons assigned are, of course, the recent changes in the hours of work, the higher price of coal and other materials, the additional expenses of manufacture generally, and a falling off—or rather a lower percentage increase—in the consumption of gas than was anticipated.

Ottoman Gas Company.—The accounts of this Company for the six months ending Dec. 31 last, which will be presented to the shareholders at their half-yearly meeting to-day, show that the gas-rental in this period amounted to £7708; the net profit being £3578. The amount standing to the credit of the profit and loss account is £3709 13s. 1d., out of which the Directors recommend a dividend at the rate of 7 per cent. per annum on both classes of shares, and the addition of £500 to the reserve fund; carrying forward the balance of £584 13s. 1d.

Rochdale Corporation Gas-Works.—The year which ends to-day has witnessed the largest increase in the make of gas which has been known at the Rochdale Gas-Works during the present decade. Up to Friday night, the make had been 348,470,000 cubic feet—an increase of no less than 19,683,000 feet upon the figures for the corresponding period of the previous year. The deputation of the Gas Committee which has visited various towns with a view to ascertain the best form of retort to introduce in the prospective enlargement of the works has determined to recommend the erection of 28 inclined retorts. These will, it is estimated, supply the extra demand of next winter, and will not necessitate at present the construction of the proposed additional retort-house.

The Siding to the Coventry Gas-Works.—The Committee appointed at a recent meeting of the Coventry Town Council to consider and report upon an alternative scheme to that proposed by the Gas Committee for connecting the gas-works with the Nuneaton Railway, have already set to work. They have laid the plans referring to the Gas Committee's siding before Mr. E. Woods, C.E., of Westminster, and have instructed him to "inspect the gas-works, the Nuneaton Railway, the Bablake Schools, the siding shown in the plans, and locality generally, and make surveys with a view to ascertaining where there is any, and if any what, altered or altogether different course for the required siding, and of a kind the Council may prudently, or in other words, without unreasonable sacrifice, in respect of cost of construction, maintenance, or working expenses, adopt?"

The Value of the Newport (Mon.) Gas Company's Shares.—It is generally understood (says our Welsh contemporary, the *Star of Gwent*) that the electric light is to be the light of the future. This may be so; but one thing certain is that the monied inhabitants of Newport are exceedingly anxious to become possessed of shares in our local Gas Company. The Directors, being in want of capital to extend their works, offered for sale by public auction last Wednesday afternoon sixty £100 shares. They are known as "C" stock, and bear a dividend of 7 per cent. The large attendance which assembled before the opening of the sale supplied certain proof that the competition would be remarkably keen. This proved to be the case. The first share was started at £120; but the second bid advanced it to £138, and the purchaser eventually had to pay £143 for his coveted prize. Between this figure and £146, the whole of the shares were disposed of in a very short space of time; and the Auctioneer would not have experienced the slightest difficulty in selling treble the number, if he had had them at his disposal.

The Warrington Corporation and the Water-Works.—Several interviews have recently taken place between Warrington manufacturers who supply themselves with water from the River Mersey and the Corporation, with a view to the abandonment of the opposition of the former to the Improvement Bill. It was suggested that the manufacturers should offer the Corporation £3000, and the payment of an annual sum equal to 3d. per lineal yard of the pipes that passed under the streets, on condition that a clause was inserted in the Bill securing to the manufacturers for all time the right to continue their supply from the Mersey. At a meeting of the Town Council last Wednesday, it was decided to insert a clause in the Bill embodying these terms. The Corporation and the manufacturers having come to this arrangement, the water undertaking can, it is said, be purchased without any charge whatever being thrown upon the rates. It is understood that the firms referred to use about 2 million gallons of water per day, which is considerably more than the consumption for domestic purposes, and which is estimated at a million gallons.

The Recent Strike of Gas Stokers in Manchester and Salford.—A public meeting was held in Stevenson Square, Manchester, last Sunday week, for the purpose of giving Mr. W. Horrocks, the late District Organizing Secretary of the Gas Workers' Union, an opportunity of vindicating his conduct during the recent strike. In the course of his speech on the occasion, he stated that all through the movement he had acted honestly, and challenged contradiction. The gas strike had been a far more serious battle to him than it had been to anyone, for he was out of employment, and had no chance of getting any; for it was well known that the leading employers in Manchester and Salford would not have him among their men. He had not received his discharge, but had been suspended without any reason being assigned to him. He had been charged with running away with £70; but this was not true. When the bills were reckoned up, it was found that a sum of £23 was due to the Union; and he paid it. He had no right to pay this amount; and seeing that he had not been discharged, he wanted his salary paid since his suspension. A letter was read from Mr. W. Thorne, General Secretary of the Union, stating that there was no charge of dishonesty against Mr. Horrocks. No resolution was passed on the matter.

The Action of Sheffield Water on Lead.—Mr. A. H. Allen delivered a lecture last Friday evening before the Sheffield Pharmaceutical and Chemical Society, on the Sheffield water, with special reference to its action on lead. The lecturer referred to the general character of the local water supply as a soft moorland water, liable to contain peaty matter, but otherwise of excellent quality. He pointed out that the water from the Bradfield reservoirs passed through a tunnel some two miles in length, in which it was not improbable it underwent some alteration in its composition. At any rate the water from this source, as delivered to the lower levels of the town, was practically inactive upon lead; whereas the reverse was the case with the water from the Redmires reservoirs, as supplied to the higher levels. The probable cause of the action of the Redmires water on lead was explained, together with the prospect of treating it effectually by limestone, chalk, or actual lime. Either way, the free acid was neutralized, and the water rendered inert. There was no fear, he said, of any notable increase in the hardening of the water by this treatment. It would simply make one supply like the other, and would cost but little as compared with the proposal to filter the water through complex filters, which would soon deteriorate and cease to have the required action.

The Northern Coal Trade.—The coal trade, after some days of very great demand, is finding the relief which follows the settlement of the strike in the Midlands. Coal is more plentiful; and the prices of certain kinds will fall, for the output of both household and gas coal at this season of the year is usually above the requirements. But steam coal in Northumberland must be expected to be steady, as the season for shipping largely to the Baltic is now near. The price rose from 12s. to 13s. per ton, free on board ship in the Tyne; and though the latter price is still asked, it is probable that there would be concessions of discount. Second-class coal is at about 11s. 6d. to 12s. per ton free on board; and small coal is firm at about 8s. per ton. Gas coal is steady; some sales of moment, made in the time of the strike, having reduced stocks where they existed. The price asked for best gas coal varies from 13s. to 14s. free on board. There is a rather lessened demand for manufacturing coal; the strike of the Tyne and Wear engineers having thrown a good deal of coal on the market, which cannot now find an outlet to Lancashire. Household coal is dull again. Some Durham coal owners sent large quantities of household coal to London; but the demand has eased off, and the price is now decidedly weaker. Coke is steady; gas coke being freely sent now by ship, as well as having a large consumption at the cement-works.

The Oil Lighting at Erith.—Our local correspondent writes that Mr. Defries has made another effort to induce the Erith Local Board to relieve himself and Mr. Carson from the pains and penalties to which they made themselves liable should the contract with the Defries Company for the lighting of Erith by oil be in any way broken. They now seek to be released from the fines of 2s. 6d. per lamp in the case of non-lighting, on the ground that they give a bonus to each of the lamplighters who have no lamps reported out during the week. The labour, however, has been in vain; for the Board having become cognizant of the disapproval of their constituents to the change from gas to oil, are now seeking to wash out a little of the caustic by presenting a financial sheet with a low payment for lighting tabulated thereon. This they are able to do by the infliction of fines; for, as a matter of fact, at Erith it is impossible to keep the lights burning. The Board, however, may shake hands with themselves; but outside congratulation does not appear to border on the demonstrative, and the general opinion appears to be that, as the Directors of the West Kent Gas Company, through their Secretary (Mr. R. P. Keys), have expressed their desire to work amicably with the Board, a return to gas lighting in the public thoroughfares ought to be at once arranged for, and the present inefficient glimmerings extinguished.

Contractors' Liabilities for Injuries to Workmen.—In the Queen's Bench Division of the High Court of Justice last Friday, the case of *Archer v. Dowra and Son* came before the Lord Chief Justice and the

Master of the Rolls. The defendants are contractors, and last year they were employed by the Lambeth Water Company to carry out certain work. Part of it consisted in digging a trench; and the plaintiff was a workman employed in it. There were struts to keep up the earth, and stretchers between them. The plaintiff, wishing to descend to a lower level in the trench, placed his hand upon a stretcher, which gave way under the pressure, and he fell and was injured. He sued the defendants in the County Court, under the Employers' Liability Act, and recovered £50 damages; but now judgment was asked for the defendants on the ground that it had not been shown that there was any defect in the plant or machinery so as to make them liable. The case for the plaintiff was that the strut should have been spiked, so as to keep it in its place; but on the other side it was said that the plaintiff knew that the stretcher was not spiked, and so there was negligence on his part in leaning on it. The Court said there was evidence that many workmen went up and down the trench in the same manner as the plaintiff. The stretchers constituted a way, the safety and security of which the defendants were bound to see to, and they had not done so. There was, therefore, evidence upon which a verdict for the plaintiff could be found. The appeal was dismissed.

Stokers Fined for Leaving Work without Notice.—At the Ashton Borough Court, on Monday of last week, before Mr. W. H. Buckley (Chairman) and a Bench of Magistrates, William Bowring was summoned for leaving the employ of the Ashton Gas Company without giving a week's notice, in consequence of which the Company claimed £1 15s. for damages. Charles Postlethwaite and John Turner were also summoned for like offences; the damages being laid at £1 10s. Mr. C. H. Booth prosecuted, and informed the Bench that the information was laid under the Act relating to employers and workmen. In the case of Bowring, the claim was for 35s. for wrongfully quitting the service of the Company without giving a week's notice. For some time past the Company had been very much annoyed and harassed by workmen summarily leaving their employ. It was well understood by all the three defendants that a week's notice was required to be given or taken before they could quit their employment. So well was it known to them that the Company had in their possession a notice signed by each of them giving a week's notice when the contemplated strike was on. The defendant Bowring left his work on the 21st of February without giving notice of his intention to do so. The rate of wages of the defendants was 5s. a day. Mr. David Clarke, Manager of the works, was called, and proved the damages sustained by the Company. He explained that they arose in consequence of his having to put inexperienced men in the defendants' places, and of their using more material and producing less gas. The defence was that they had never undertaken to give or take seven days' notice. After a rather long hearing, the Bench ordered the defendants to pay 20s. each, and costs.

The Water Supply of the Mumbles (Swansea).—The deputation appointed at a recent Vestry meeting (*ante*, p. 404) to wait upon the Mumbles Local Board to urge upon them the desirability of purchasing the works of the Water Company, have carried out their commission; but with ill-success. The spokesman of the deputation was Mr. W. R. Collins, who stated that the Vestry meeting was under the impression that it would take too long a time to sink wells, and have water ready by the summer; and they therefore wished to call the attention of the Board to the urgent necessity there was for obtaining an immediate supply, which, in their opinion, could only be procured by purchasing the water-works. Sir John J. Jenkins had offered to refer the matter to arbitration, so that the real value of the works might be ascertained. In the course of a letter to him (Mr. Collins), Sir John stated that the reason why the Water Company stopped the supply, was not for want of water, but because the Local Board, after repeated applications, declined to enforce their powers to compel all the users of water to connect with the mains, and to pay for the water they consumed, instead of taking the Company's water from their neighbours' taps for nothing, thus depriving the Company of their just revenue. He added that there was an abundant supply of water at the Company's spring at Caswell, which could be pumped into the reservoir, and laid on to the Mumbles within 48 hours. The engine and pumps were in good condition. The reservoir, however, required some repairs; but the supply need not be delayed for any time. Replying to the deputation, the Chairman of the Board (Mr. N. Morgan) said that they were satisfied the Company were not able to give an immediate and proper supply; and they declined to purchase the works by arbitration. Thus things remain in the same position as before; and there are no signs of a movement being made to meet the present water requirements of the district.

Mr. Brayshaw and the British Water-Gas Syndicate.—Our readers will remember that towards the close of last year Mr. T. Brayshaw, a member of a firm of Solicitors at Settle, and a shareholder in the British Water-Gas Syndicate, took steps to have an investigation into the Company's affairs, in view of the unsatisfactory position of the concern, as indicated by the low value of its shares in the market. Mr. Brayshaw's proceedings were adversely criticized in the *Lighthouse*—a paper which had systematically "written up" the Syndicate; and in the course of one article, it was imputed to him that, having no interest in the Company, he had taken upon himself to advertise his name before the public in order that discontented shareholders might make use of his professional services, and by that means he might, as a Solicitor, put funds into his pocket. On the appearance of this article, Mr. Brayshaw intimated his intention to take criminal proceedings against the paper; whereupon an apology was inserted. An application to proceed criminally was nevertheless made; but the Judge before whom it came suggested that a civil suit would be sufficient. This matter called forth another article in the *Lighthouse;* and Mr. Brayshaw then commenced an action for libel. This was tried on Monday last week at the Leeds Assizes, by Mr. Justice Day and a special jury, when it transpired that Mr. Samson Fox, of the Leeds Forge Company, the Chairman of the Syndicate, was the principal shareholder in the paper. The plaintiff did not allege that he had sustained any pecuniary damage from the publication of the articles in question. For the defence it was stated that neither in the plaintiff's circular nor in his advertisement was there anything to show that he was a shareholder of the Syndicate; and the first article was written to prevent the wrecking of the concern. Plaintiff had not suffered any injury, but on the other hand had profited by the movement, inasmuch as he was now receiving a salary of £300 a year as a Director of the Company. The jury returned a verdict for the plaintiff, with £350 damages.

The Water Supply of Richmond (Surrey).—The Water Engineer of the Richmond Vestry (Mr. W. G. Pierce) has lately been conferring with Mr. W. Whittaker, F.R.S., F.G.S., &c., on the subject of the steps to be taken for the purpose of obtaining more water for the supply of the town. Mr. Whittaker stated his views in a letter to Mr. Pierce, which was submitted to the Vestry at their meeting last Tuesday. He said he could see only one course open—viz., to sink a shaft through the tertiary beds into the chalk, and then to drive galleries, so as to cut the fissures in the chalk to the greatest possible extent. It was along such fissures, slight though they were, that water chiefly found its way through the chalk. The bold attempt to get a supply from a deeper-seated source than the chalk had unfortunately failed, in common with some other attempts of a like kind; and though a certain amount of water might be procured from sandy beds between the London clay and the chalk, these could not supply the wants of Richmond. Mr. Pierce expressed the belief that the Vestry had the means of widely extending such underground work, without incurring any expense in making arrangements with neighbouring landowners for acquiring rights under their land. He called attention to the fact that underground galleries not only increase the yield of water, but also serve as reservoirs; for after pumping has ceased, the galleries gradually fill with water, and on again commencing work there is a large amount of water ready to hand. While not expecting that at Richmond an enormous supply would be obtained (as in some works where the chalk was at or near the surface, and where some millions of gallons were pumped daily), he saw no reason why the supply needed for the town should not be obtained. On the same occasion, Mr. Pierce reported on the progress lately made at the Terrace Gardens well. The boring there has been carried to a further depth of 48 feet, making a total of 98 feet (11-inch boring), and a total depth of well and boring of 418 feet; leaving 52 feet of boring to complete the contract. The Vestry have at present 118,000 gallons of water at their command daily; but this does not enable them to dispense with the auxiliary supply furnished by the Southwark and Vauxhall Water Company.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

For Stock Market Intelligence, see ante, p. 538.

Issue.	Share	When ex-Dividend.	Dividend & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10¾	Alliance & Dublin 10 p. c.	10	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p. c.	10	12¾—13¼	..	5 11 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	109—111	..	4 10 1
100,000	20	28 Nov.	8	Bahia, Limited	20	20—21	..	7 12 4
200,000	5	14 Nov.	7½	Bombay, Limited	5	6—6½	..	5 15 4
40,000	5	,,	7½	Do. New	4	4⅞—5¼	..	5 17 10
380,000	Stck.	27 Feb.	12½	Brentford Consolidated	100	217—222	+2	5 10 4
125,000	,,	,,	9¾	Do. New	100	160—165	+2	5 12 2
220,000	20	13 Mar.	11	Brighton & Hove Original	20	40—42	..	5 4 9
320,000	20	27 Sept.	11¼	British	20	45—47	+2	4 15 9
50,000	10	13 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	12½—13½	..	7 8 2
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	105—108	..	5 11 1
150,000	20	27 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13⅜	Commercial, Old Stock	100	250—255	+1	5 7 10
130,000	,,	,,	10⅜	Do. New do.	100	200—210	..	5 2 4
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 2
557,320	20	12 Dec.	13	Continental Union, Limited	20	46—47	..	5 10 8
242,680	20	,,	13	Do. New '69 & '72	14	31—33	..	5 10 3
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	30 Jan.	13	European, Limited	10	23—25	..	5 4 0
120,000	10	,,	13	Do. New	7½	17½—18½	..	5 5 3
354,060	10	,,	13	Do. do.	5	12—13	+½	5 0 0
5,470,620	Stck.	13 Feb.	13¾	Gaslight & Coke, A, Ordinary	100	245—250	−3	5 10 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 17 8
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	..	3 18 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	121—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	180—185	..	4 1 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	158—163	..	4 5 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	247—252	..	3 19 4
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	114—117	..	3 8 3
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—127	..	3 10 10
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170	..	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	217—222	..	5 8 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5¼	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	114—116	..	4 6 2
541,920	20	28 Nov.	6	Monte Video, Limited	20	18½—19¾	..	6 3 1
150,000	5	28 Nov.	10	Oriental, Limited	5	8½—9	..	5 11 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5¾—6¼	..	5 12 0
166,870	10	26 July	4	Pará Limited	10	3¾—4¼	..	8 17 9
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14¾—15¼	..	6 9 2
500,000	Stck.	27 Feb.	13¾	South Metropolitan, A Stock	100	275—285	..	4 12 11
1,350,000	,,	,,	11¼	Do. B do.	100	220—230	..	5 0 0
141,500	,,	,,	12	Do. C do.	100	230—240	..	5 0 0
650,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—142	..	3 10 5
60,000	5	27 Feb.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
						*Ex.div.		
				WATER COMPANIES.				
728,446	Stck.	30 Dec.	9¾	Chelsea, Ordinary	100	260—265	..	3 11 8
1,720,560	Stck.	16 Oct.	7¼	East London, Ordinary	100	209—214	−1¼	3 10 1
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	123—127	+1	3 10 10
700,000	50	12 Dec.	9	Grand Junction	50	122—126	..	3 11 5
708,000	Stck.	13 Feb.	10¾	Kent	100	271—276	..	3 16 0
1,043,800	100	30 Dec.	9¾	Lambeth, 10 p. c. max.	100	254—258	..	3 13 7
406,200	100	,,	7¾	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	124—128	..	3 2 6
500,000	100	13 Feb.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk	100	127—130	..	3 1 6
902,300	Stck.	12 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	161—165	−1	3 12 9
126,500	100	,,	6	Do. 7½ p. c. do.	100	157—162	−3	3 14 1
155,066	Stck	12 Dec.	10	West Middlesex	100	260—265	..	3 15 6

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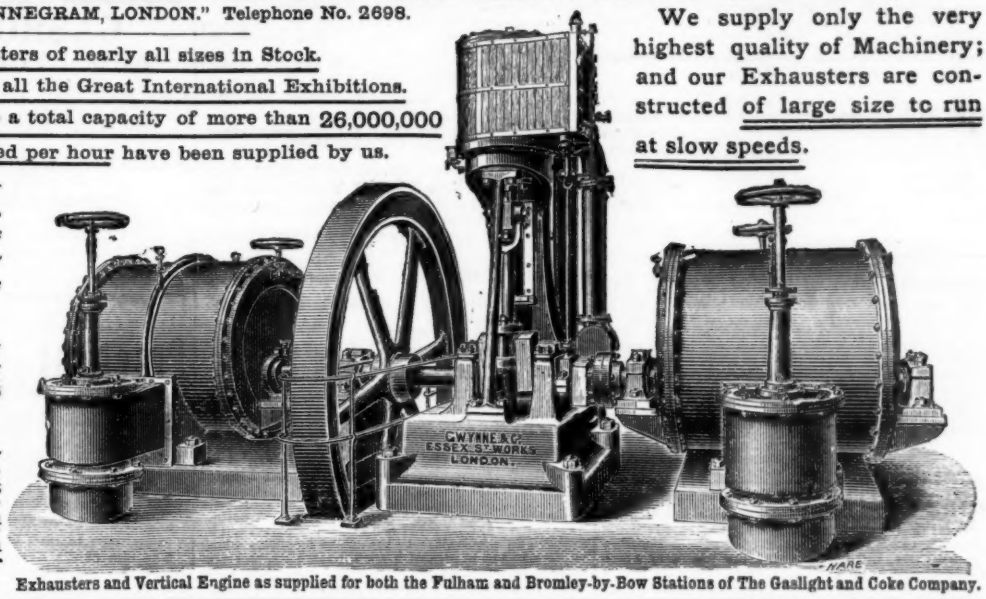

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WANTED, by a practical (married) Man, age 32, the MANAGEMENT of a small Gas-Works. Has been Working Foreman for the past nine years. In charge of present Works for seven years. Understands Retort Setting, Main and Service Laying, Fixing Meters, Reading Indices, also Sulphate of Ammonia. Has worked in Gas-Works since twelve years old. Life abstainer. Unquestionable references. No objection to going abroad.

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Applications to be sent in on or before the 2nd of April, stating salary required, and enclosing not more than four testimonials, addressed to the CHAIRMAN, Gas Company, Beaconsfield, BUCKS.

TIMMIS & CO., of STOURBRIDGE, Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

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*** See Advertisement p. 522 of last week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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Inquiries should be addressed to THE COZE SYNDICATE, LIMITED, 86-88A, LEADENHALL STREET, E.C.

By Order of Mortgagees and Liquidators.

MABLETHORPE, LINCOLNSHIRE.

MESSRS. HEPPER AND SONS will SELL BY AUCTION, in their Estate Sale Room, East Parade, Leeds, on Tuesday, the 1st day of April, 1890, at Three o'clock in the Afternoon precisely (subject to Conditions of Sale to be then read), the

MABLETHORPE GAS-WORKS,

Situate on the Louth Road, in Mablethorpe St. Peter's, in the County of Lincoln.

The Works are erected on a piece of Land containing 2420 square yards or thereabouts, leasehold for 99 years, from the 21st of September, 1882 (ground rent of £10 per annum), and comprise the following:—

Brick Retort-House, with Iron Roof, 36 ft. by 27 ft., containing two Beds of Retorts, &c.; also Set of Condensers.

Brick, Coal, and Lime Sheds; Store-House, Purifying-House; Gasholder, with Brick Tank, capable of holding about 7000 cubic feet, and Tar-Tank; Manager's Residence; Gas-Mains and Pipes; Machinery; and Fixtures on the Land.

The Distributing Plant (consisting of about five miles of 4-inch and half-a-mile of 3-inch Gas-Mains), Public Lamps, Gas-Meters, Piping, Gas Cooking-Stoves.

The Purchaser will be required to take at a valuation the Coal, &c., particulars of which may be obtained as below.

The Works are situate about 600 yards from the Mablethorpe Railway Station. They have only been erected some Seven years, and are well-built and thoroughly adapted for the purpose of supplying the favourite Watering Places of Mablethorpe, Sutton-on-Sea, and the adjacent Villages, to which Mains are laid.

Further particulars may be obtained from, and the Conditions of Sale may be inspected on application to the Auctioneers, or the under-mentioned Solicitors, at any time prior to the Sale.

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TO BE SOLD—A Single-Lift Gasholder, 45 feet diameter by 15 feet deep; in good condition.
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FOR SALE—One Single Gasholder, 80 feet by 20 feet (owing to extensions at Blackpool). To be erected complete; in first-rate condition.
Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

CAST-IRON TANK AND GASHOLDER FOR SALE.

THE Rugby Gas Company invite Offers for a CAST-IRON TANK, with its GASHOLDER, 62 feet in diameter and 14 feet deep, in good condition, and in use at their old Works.
Apply to Mr. P. SIMPSON, the MANAGER.
Rugby, March 10, 1890.

FOR SALE—One 8-horse power Engine and COAL BREAKER, with top and bottom Elevator, Gear, and Patent Wrought-Iron Chain, with Malleable Iron Buckets complete.

The above Machinery is almost new, having only been in use about Three months.

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THE Gas Committee invite Applications for SPACE, from Persons desirous of Exhibiting Gas Cooking Stoves, Gas-Fires, Gas-Engines, Burners, Fittings, Globes, and other Gas Appliances, at the above Exhibition.

There will be a competitive examination of the Stoves.

Applications, giving maximum and minimum space desired, and other information as to Exhibits, to be made to the Gas Secretary, Gas Offices, Rotherham, not later than Saturday next, the 29th of March inst.

By order,
H. H. HICKMOTT, Town Clerk.
Corporation Offices, Rotherham,
March 22 1890.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,503 cubic feet per ton; Illuminating Power, 16·2 candles.

AYR GAS COMPANY.

TENDER FOR PURIFIERS.

TENDERS wanted for the construction and erection, complete, of Four PURIFIERS, 16 feet square, 14-inch Connections, Lifting Gear, &c., and also IRON SHED, 50 feet by 45 feet.

Specification can be had on payment of 10s. to the undersigned.

Tenders to be sent to the undersigned not later than Friday, the 28th inst.

W. SMITH, Gas Manager.

Ayr, March 19, 1890.

TO PIPE FOUNDERS.

THE Directors of the Monmouth Gas and Water Company, Limited, are prepared to receive TENDERS for the supply of 4600 yards of 6-inch Spigot and Socket WATER-MAINS. Each 9 feet length to weigh 2 cwt., and to be coated with Dr. Angus Smith's Composition, and tested to 500 feet head.

Tenders to state price per ton, delivered at Monmouth Station.

TERMS: Net cash on delivery.

The Directors do not bind themselves to accept the lowest or any tender.

THOMAS BRACE,
Secretary and Manager.

Gas and Water Office, Monmouth.

PURIFYING PLANT.

THE Lymm Local Board invite Tenders for the Construction and Erection of PURIFYING PLANT, consisting of four 10-feet square Purifiers, Centre-Valve, Lifting Gear, and the necessary 9-inch Connections.

Full particulars and specifications can be had on application to Mr. A. Graham, Gas Manager.

Tenders to be sent to the undersigned, endorsed "Purifiers," on or before March 29, 1890.

The Board reserve the right of accepting the lowest or any tender.

N. MULLARD,
Clerk to the Board.

Lymm, March 14, 1890.

TO TAR DISTILLERS, ETC.,

THE Altrincham Gas Company are prepared to receive OFFERS for the purchase of the surplus GAS TAR to be produced at their Works for Two years, commencing the 1st of April, 1890.

Estimated production, about 800 tons per annum.

The Tar will be delivered to the Contractor at the Company's Works.

Further particulars may be obtained from Mr. J. E. Lamb, Manager, Gas Office, Altrincham.

Sealed tenders to be sent to the undersigned, marked "Tender for Tar," by Twelve o'clock on the Morning of Wednesday, April 9, 1890.

F. R. B. LINDSELL, Secretary.

Gas Offices, Altrincham,
March 21, 1890.

THE Directors of the North Bierley Gas Company have FOR SALE Two PURIFIERS, 18 feet by 11 feet, with Covers, Lifting Gear, 12-inch Connections, and Two 12-inch Four-Way Valves, in good condition.

Offers for the above to be sent in, addressed to the Chairman, on or before Thursday, the 27th day of March, 1890.

The Boxes may be seen, and further information obtained, on application to Mr. W. Oldfield, Manager.

By order,
EPHRAIM SUCKSMITH, Secretary.

Gas-Works, Oakenshaw, near Bradford,
March 14, 1890.

NORTH BIERLEY GAS COMPANY.

THE Directors of the above Company invite TENDERS for the purchase of all the AMMONIACAL LIQUOR of 5° Twaddel, and also the surplus TAR produced at their Works for One year, from the 1st day of April, 1890.

Tenders are to be sent in, addressed to the Chairman, on or before Thursday, the 27th day of March, 1890, endorsed on the outside "Tender for Ammoniacal Liquor" or "Tar."

Further information may be obtained on application to Mr. W. Oldfield, Manager.

The Directors do not bind themselves to accept the highest or any tender.

By order,
EPHRAIM SUCKSMITH, Secretary.

Gas-Works, Oakenshaw, near Bradford,
March 14, 1890.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Berwick and Tweedmouth Gaslight Company invite TENDERS for the purchase of the TAR and AMMONIACAL LIQUOR to be produced at their Works for One or Two years, from the 25th of May, 1890.

The estimated quantity of tar will be about 41,000 gallons, and liquor about 85,000 gallons per annum. The strength of the latter will be 5° Twaddel.

The tar and liquor will be sold at per 100 gallons at the Gas-Works, Spittal; and the Contractor must be prepared to keep the Company cleared of both Tar and liquor, and provide all the necessary barrels for the purpose, and pay all expenses of removal to and from the Works.

Further particulars may be obtained on application to the undersigned, to whom also tenders, sealed and endorsed "Tender for Tar and Liquor," must be delivered not later than Twelve o'clock Noon, on Tuesday, the 22nd of April, 1890.

The Directors do not bind themselves to accept the highest or any tender, and may require security for the performance of the Contract.

By order,
T. G. TURNER, Secretary.

Berwick-on-Tweed, March 22, 1890.

EDINBURGH AND LEITH CORPORATIONS GAS.

THE Commissioners invite Tenders to supply GENERAL STORES (Coals, Lime, Pipes, Paints, &c., &c.) required at their Works in Edinburgh and Leith during the year, from the 15th of May next.

Tender forms and all information can be had on application to the Engineers, at these Works.

Offers must be lodged, not later than Ten o'clock, on Saturday morning, the 5th prox., in sealed envelopes, addressed to the undersigned.

The Commissioners are not to be bound to accept the lowest or any tender.

JAMES M'G. JACK, Clerk.

25, Waterloo Place, Edinburgh,
March 22, 1890.

TREDEGAR LOCAL BOARD.

TENDERS FOR RETORT-BENCHES.

THE above Board invite Tenders for the erection of certain RETORT-BENCHES, and all the necessary IRONWORK.

Further particulars can be obtained on application to the Gas Manager, Gas-Works, Tredegar.

Sealed tenders to be sent in to me, the undersigned, endorsed "Retort-Benches," on or before the 8th day of April next.

The Board do not bind themselves to accept the lowest or any tender.

By order,
JNO. ALEX. SHEPARD,
Clerk to the said Board.

57, Queen Street, Tredegar,
March 18, 1890.

SCARBOROUGH GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR produced at their Works for One year, from the 18th day of April next.

Conditions of tender and necessary particulars will be supplied on application to the undersigned, to whom tenders, in accordance with such conditions, and properly endorsed, must be delivered not later than Noon on Monday, the 7th day of April next.

By order,
WILLIAM J. MOON,
Secretary and Manager.

Gas Offices, Scarborough,
March 19, 1890.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

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Chemist and Superintending Gas Examiner to the London County Council.

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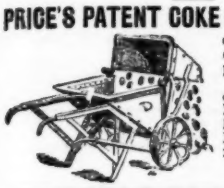

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Manufacturers of GAS-RETORTS, GLASSHOUSE, FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY,
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

IMPROVED RETORT SETTING.
W. G. WALLER & Co.,
RETORT SETTERS & CONTRACTORS,
Having had much experience in the Setting of Retorts beg to call the attention of Gas Engineers and Managers to their Improved System of Setting Retorts and Tar-Furnaces.
Contractors for Building Shafts, Tanks, Retort Benches, and all other Buildings connected with Gas-Works.
Estimates on application.
The Poplars, Waddon, Croydon, Surrey.

THOMAS TURTON AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
London Office:
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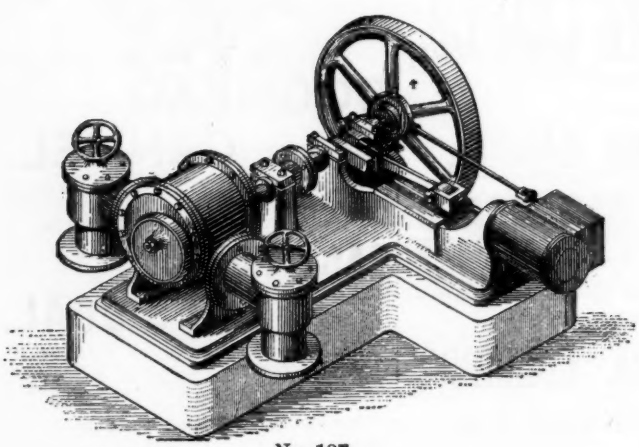
ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on application.

GAS COAL.

POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17¼ candles.
One ton yields 12¼ cwt. of good coke.
This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

G. WALLER & Co.'s NEW PATENT GAS EXHAUSTER.
MADE WITH 4, 3, OR 2 BLADES.
In use at, or on order for, over 120 *Works, equal to* 6,840,000 *Cubic Feet per Hour.*
Oldest Makers of Beale Exhausters for over 300 Works and 25,600,000 cubic feet per hour.
1,000 to 250,000 CUBIC FEET PER HOUR WITH OR WITHOUT ENGINE COMBINED.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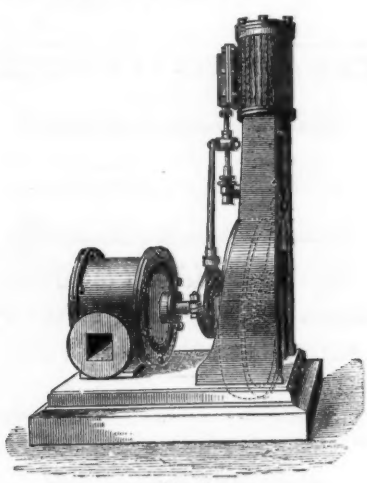
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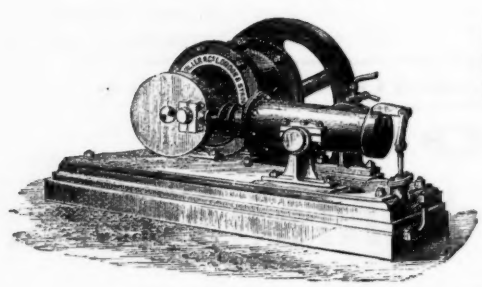
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No. 137.—Horizontal Combined Engine and Exhauster.
No. 6.—Vertical ,, for small space.
No. 5.—Oscillating ,, for small works.

BYE-PASS VALVES.
Disc, Rack, and Screw Valves, Compensating Governors (For Steam Throttle Valves),
Tar, Liquor, and Water Pumps, Hydraulic Main Valves, Coke-Breaking Machines.

SEE PREVIOUS ADVERTISEMENTS. ILLUSTRATED CATALOGUE ON APPLICATION.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.,
NEAR SOUTHWARK BRIDGE (FOUR MINUTES FROM HOLLAND STREET), AND AT
STROUD, GLOUCESTERSHIRE.

THE ONLY RELIABLE
DRY CENTRE-VALVE.
WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.
ALSO MADE FOR TWO OR THREE PURIFIERS.
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.
Write for Prospectus.
ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.
F. WECK, 86, NEW STREET, BIRMINGHAM.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

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For particulars, apply to
LOCKE & CO.,
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(GREEN CLOTH, GILT LETTERED)
MAY BE HAD OF THE PUBLISHER,
PRICE 2s. EACH.

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For Streets, Railway Platforms, &c., &c.
(Patented the 4th of May, 1889.)

This Lamp and Top, being made entirely of Glass, is perfectly impervious to corrosion, and therefore invaluable in Manufacturing and other Towns. The Top can be had in clear or coloured Glass; and is much cheaper than the old style of metal frames. The New Lamp can be adapted to the old metal frame top.
Prices on application.

PILKINGTON BROS.,
Glass Works, St. Helens, Lancashire.

WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,
Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

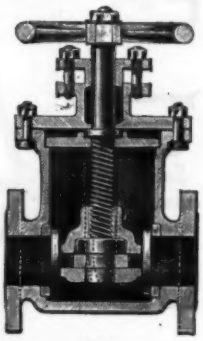
PATENT
MACHINE-MADE GAS-RETORTS.

S. PONTIFEX & CO.,
GAS and WATER ENGINEERS,
Manufacturers of and Contractors for the Maintenance of
PUBLIC LAMPS & LANTERNS;
GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.
WELL LAMPS, STREET NAME TABLETS,
LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,
LANTERN COCKS, REGULATORS,
Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.
BROWN'S PATENT
LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF
BOX'S PATENT
PUTTYLESS STREET LAMP.
This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.
S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.
Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

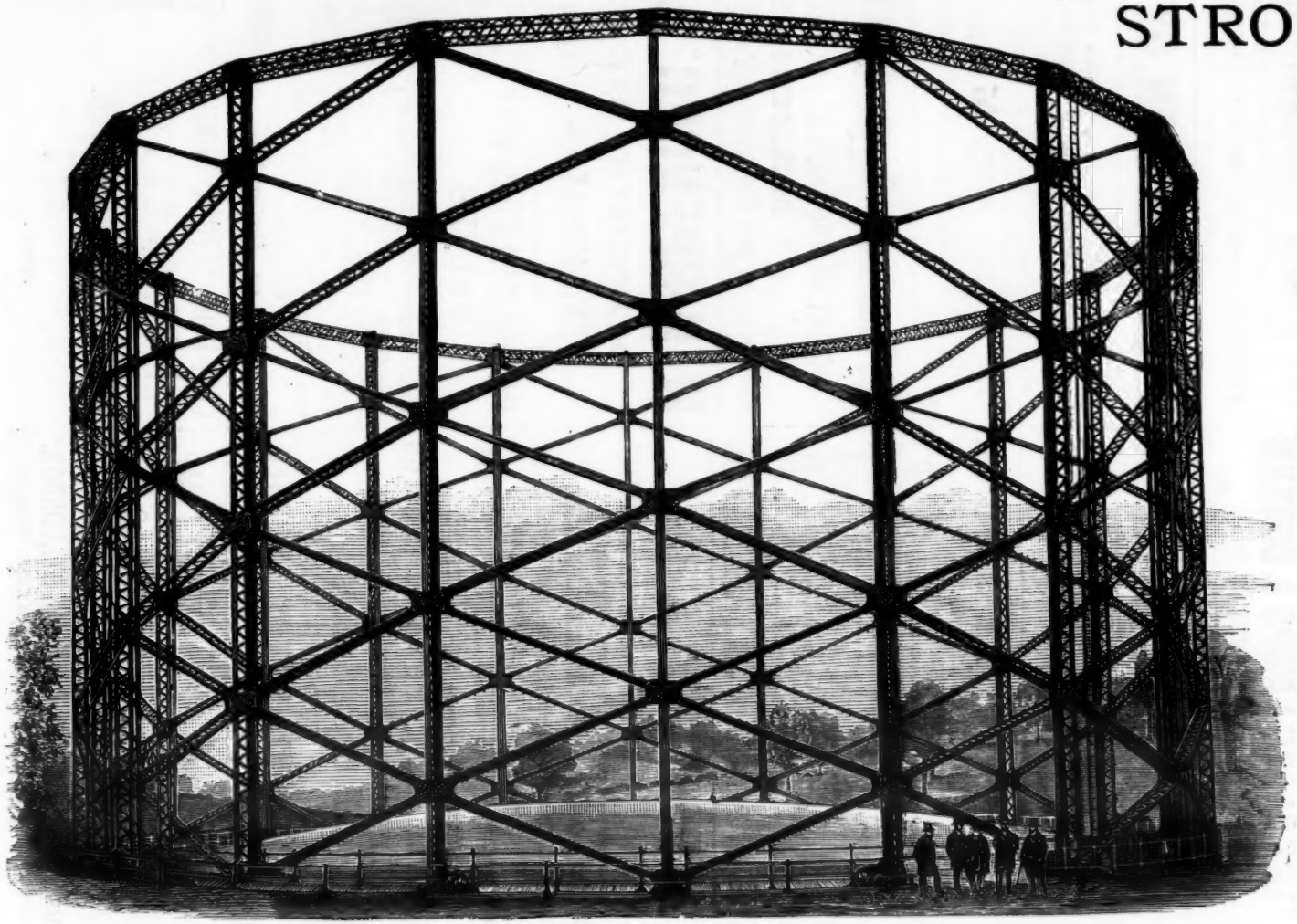
THE
ÉTOILE GAS-LAMP
(REGENERATOR).
Sole Makers and Proprietors,
THE ÉTOILE GAS-LAMP COMPANY,
Gas Lighting and Ventilating Engineers,
PRINCESS STREET, **MANCHESTER.**
LISTS ON APPLICATION.

OXYGEN, OXYGEN, OXYGEN.
(Extracted from the Atmosphere by **Brin's Patent Process.**)
40,000 cubic feet always in Stock.
Managers of Gas-Works supplied with Oxygen compressed in Weldless Steel Cylinders, for experimental purposes, &c., at special rates.
Estimates given for the erection of Oxygen Producers in Gas-Works, &c.
Managers of Gas-Works specially invited to inspect our Works.
The Manchester Oxygen (BRIN'S PATENT) Co., Ltd.,
GREAT MARLBOROUGH ST., OXFORD ROAD,
MANCHESTER.
Manufacturers and Compressors of all kinds of Gas.

W. H. SPENCER & CO.,
HITCHIN, HERTS,
— ENGINEERS. —

PATENT CAM FULL-WAY VALVES,
1 INCH to 8 INCHES,
Instantaneous Grip and Release, occupying less Space than any other Full-Way Valve; made with either Internal or External Spindle. Gun Metal or Phosphor Bronze Valves, Seats, and Spindles.
Prices on Application.

CAST-IRON SYPHON PUMPS.
2½ by 6 in. Stroke - - £1 10 0 each.
2½ by 9 in. „ - - £1 16 0 „
WROUGHT-IRON DITTO.
2½ by 6 in. Stroke - - £1 13 6 each.
2½ by 9 in. „ - - £1 19 6
NET.

Cutler's Spiral Guide-Framing for Gasholders.



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STRONG.

SAFE.

CHEAP.

Most Advantageous Disposition of Material.

Economical both in Manufacture and Erection; and by avoiding the necessity for large Piers, permitting considerable Economy in the Construction of the Tank.

Full Particulars from the Patentees,

MESSRS.

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ENGINEERS,

GREAT GEORGE STREET CHAMBERS,

16, GREAT GEORGE STREET,

WESTMINSTER, S.W.

Works: Millwall, London, E.

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REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

Wrought-Iron

And Fittings and Accessories.

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MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
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THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
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JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

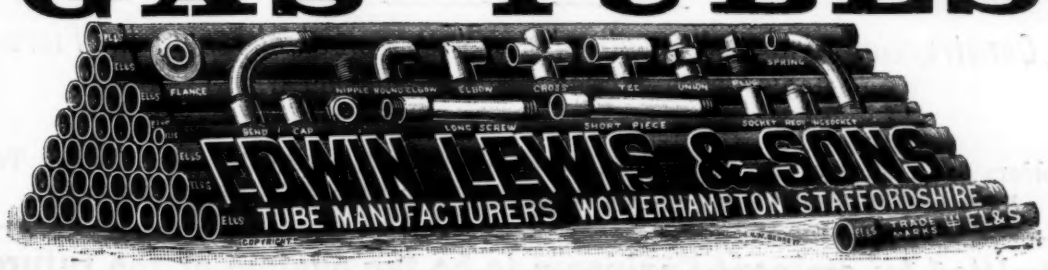
PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.
Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1¼ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides, &c.

Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to
JOHN RUSCOE, Albion Works, Hyde, near Manchester.

ESTABLISHED 1825.
GAS TUBES


MANUFACTURERS OF EVERY DESCRIPTION OF
IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES
FOR ANY PURPOSE.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.
The Schülke Regenerative Lamp

FOR
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,
NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).
Can be fixed in a few minutes.

May be seen at the Offices of the
SCHÜLKE GAS-LAMP Co.
LIMITED,
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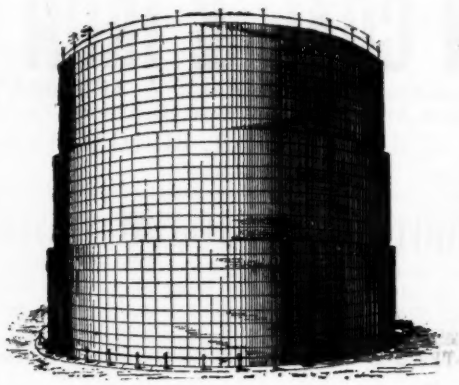
LONDON, E.C.,
Where Price Lists and full particulars may be obtained.

REVOLUTION
IN GASHOLDER CONSTRUCTION.
(GADD & MASON'S PATENTS.)

IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.

NO COLUMNS. NO FRAMING
NO COLUMNS. NO FRAMING.
NO COLUMNS. NO FRAMING.

NO PIERS ROUND TANK.
NO PIERS ROUND TANK.
NO PIERS ROUND TANK.



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NO COLUMNS. NO FRAMING.
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NO COLUMNS. NO FRAMING.

NO PIERS ROUND TANK.
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GREATER STABILITY. TILTING IMPOSSIBLE.

Tank Construction rendered far simpler and very much cheaper; the Piers and heavy Base Stones being dispensed with.

In Holders for Export a very large additional saving is effected in Carriage, Freight, Transport, and Insurance; the weight being reduced nearly 50 per cent.

Admitted by eminent Engineers to be the system of the future.

Our Alternative Arrangements of Torsional and Tensional Gearing **WE DO NOT RECOMMEND.** The former, by means of Geared Shafting, or Rack and Pinion, **IS CLUMSY**; whilst the latter, by means of Chains or Ropes, **IS UNRELIABLE AND DANGEROUS.**

Engineers intending to extend their Gas Storeage should not fail to see the TWO-LIFT HOLDER erected for the Northwich Gas Company.

PLANS, SPECIFICATIONS, AND ESTIMATES SUPPLIED.

Telegrams: "SPIRAL MANCHESTER."

The PATENT GASHOLDER SYNDICATE,
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WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
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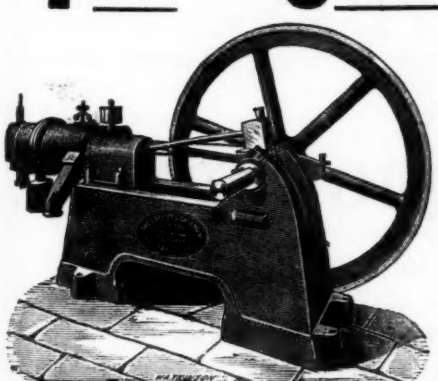
Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected, including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

THE "CAMPBELL" GAS-ENGINE.



Type of 10-HP. Engine Nominal. 25-HP. Indicated.

GREAT SUCCESS.

20 PER CENT. CHEAPER THAN ANY OTHER.
Gives the Highest Satisfaction with all kinds of Work.

Testimonial from Mr. JAMES MOON, Engineer to the Filey Gas-Works.

Feb. 9, 1889.

GENTLEMEN,—We have been using one of your Gas-Engines on our Works for about four months, and I have pleasure in saying that it does its work in a very satisfactory manner. The engine is half-horse power, steady in all its movements, and, with ordinary care, will drive the exhaust apparatus at an even gauge.—I remain, Yours respectfully,

(Signed) JAMES MOON.

For Price Lists and full particulars, apply to the Sole Makers:

THE CAMPBELL GAS-ENGINE CO. LIMITED,
WELL LANE, HALIFAX, YORKS.

RETORT SETTINGS IMPROVED

BY ADOPTING

THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.
HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

J. & H. ROBUS,
CONTRACTORS FOR GAS AND WATER WORKS,
20, BUCKLERSBURY, LONDON, E.C.

BELL'S ASBESTOS AQUOL PAINT

BELL'S ASBESTOS

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY 40 PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN, BARCELONA, and ANTWERP.

BELL'S ASBESTOS DAGGER PACKING

PATENT No. 15,498.

ROUND

SQUARE.

Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

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DEPÔTS.

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LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
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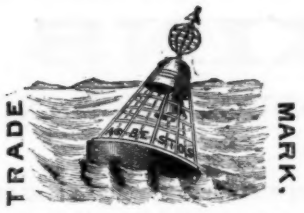

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BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
CARDIFF: West Bute Street.
BARCELONA, and ANTWERP.

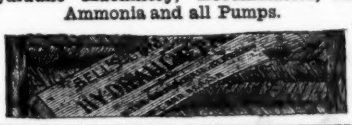
SOUTHWARK, BELL'S ASBESTOS. LONDON, S.E.

BELLS ASBESTOS YARN AND SOAPSTONE PACKING

Is the BEST LOCOMOTIVE PACKING made.

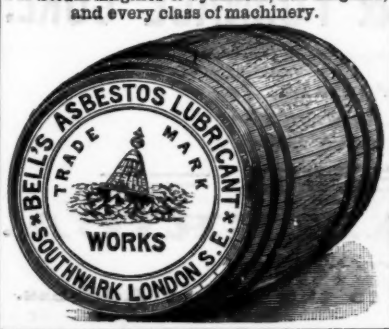
BELL'S COMPOUND HYDRAULIC PACKING

Is specially suited for Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.



BELL'S ASBESTOS LUBRICANT

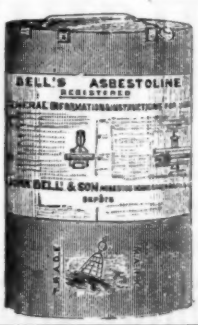
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE

The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.



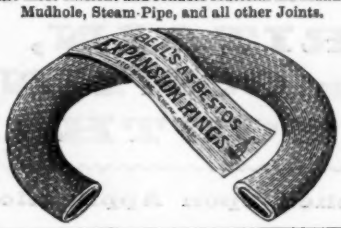
ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

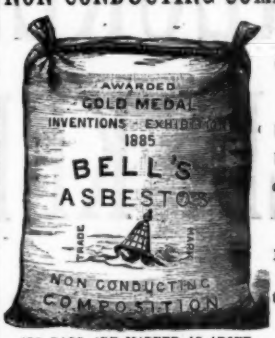
BELL'S ASBESTOS EXPANSION SHEETING

RINGS, AND TAPE.

Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



BELL'S ASBESTOS NON-CONDUCTING COMPOSITION.



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Is suitable for boilers with flat or round bottoms. Is superior to any other, and saves its cost in a few months.

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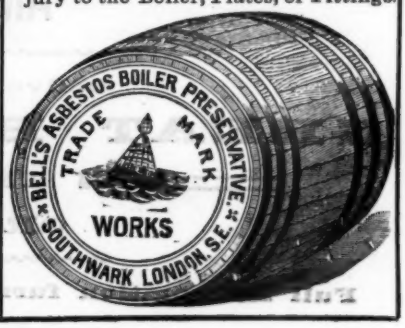
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



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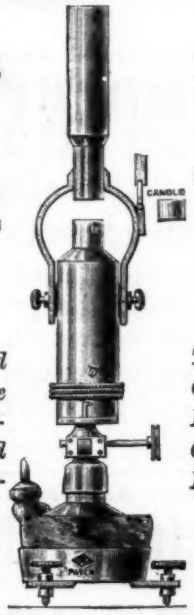

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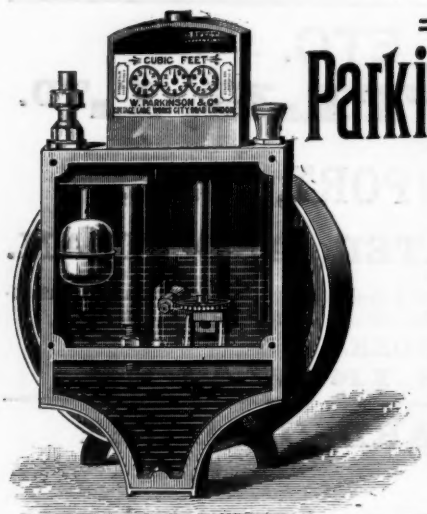

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[See also Advt., p. 534.

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